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## SOME REFLECTIONS UPON BOTANICAL EDUCATION IN AMERICA<sup>1</sup>

IN the address with which he welcomed the American Association for the Advancement of Science to Columbia University three years ago, President Butler centered his remarks on a matter of the first scientific and educational importance. He said, in effect, that for a quarter century he had been a close and friendly observer of the progress of the sciences in education, that during this time he had seen them win almost complete recognition and opportunity, but that he was obliged to confess to some disappointment at the results. He was not referring to the sciences in technical education, for in this field their status is satisfactory, but to their position in general or cultural education. He did not presume, he said, to suggest either an explanation or a remedy, but he submitted the matter to the consideration of his expert audience. These words of this eminent educational observer touched an answering chord in my own thoughts, and since that time I have found, by inquiry among my colleagues, that he voiced a feeling quite general among scientific men themselves. It seems, therefore, to be a fact that the sciences, although dealing in knowledge of matters of the greatest immediate interest, and although concerned with the most elemental of all trainings—that in the correlated use of hand, eye and mind—are still of mediocre efficiency as factors in general education. I propose now to discuss briefly the reasons I have been able to find for this

<sup>1</sup> Address of the retiring president of the Botanical Society of America, delivered at Boston, December 28, 1909.

undesirable condition of a part of our scientific affairs, and to suggest, with particular reference to our own beloved science, some remedy therefor.

It will help to clarify our problem if we can come to an understanding upon certain points in the general relations of the sciences to education, the first being this—what place ought the sciences to have in education? I think we shall agree that the sciences can never, under any circumstances, hold a place in education nearly as prominent as that of the humanities. Man is not primarily a reasoning but a feeling being. As a philosopher has expressed it, “few men think at all and they but seldom.” Hence the great majority of people in most part, and all people in some degree, can best be reached and influenced by studies which appeal primarily to the feelings, that is, by the humanities, while it is only a minority which can best be reached by studies appealing chiefly to the reason—that is, by the sciences and mathematics. But a minority has rights, and those to whom the sciences especially appeal, and to whom therefore they are of the higher cultural value, are just as entitled to efficient instruction in their subjects as are the majority in theirs. The sciences must always hold, from their nature in conjunction with that of humanity, a position quantitatively inferior to that of the humanities, but they are entitled to a qualitative equality of educational rank and opportunity. This they do not yet possess, and it is alike our duty and our interest to see that they shall.

A second point of importance in the general relations of the sciences to education is involved in the fact that the times themselves are a bit out of joint, educationally speaking. This is not a matter of individual opinion, but of well-nigh universal agreement. The recent addresses of our

younger college presidents have united in expressing dissatisfaction with the results derived from our superb educational equipment, while the remarkable declaration of principles of the National Educational Association, issued a year and a half ago, recognizes an equivalent condition for the schools. It is a fact that our students as a whole have many hazy impressions but little exact knowledge, are habitually inaccurate even in the three r's, and have too little regard for intellectual matters. The cause of it all is obvious enough. Our education, step by step with our modern life, has become luxurized. Its features disagreeable to young people have been sedulously softened, their whims are determinants of educational programs, and the responsibility for learning has been largely shifted from them to their teachers. The wise Mr. Dooley has the modern college president say to the incoming freshman: “What branch iv larnin’ wud ye like to have studied f’r ye be our compitint profissors?” and his humor as usual illumines a central kernel of truth. The trouble with our education is this, that it needs more starch; yea, it needs a bit more blood and iron. It ignores the fact that, with the mind as with the body, it is only through effort that strength can be gained, and through responsibility that character can be formed. It is not more work our students need, but work of a kind which does more to inculcate a willingness for effort, and pride in a Spartan devotion to duty—of a kind which enkindles in the heart of youth the precious spark of intellectual ambition. I would not exaggerate the defects of our present-day education. I know they do not go to the vitals, and certainly they are more serious in some places than others. But this granted, there yet remains too great a deficiency, especially in educational morale. Our col-

leges are not going to the dogs, but they certainly permit some very queer mongrels to roam at large on the campus.

Now the application of these remarks to our present problem is doubtless sufficiently plain. In an educational system which too much permits inaccuracy of work, indefiniteness of knowledge, avoidance of effort, and whimsical selection of studies—in such a system the sciences, whose essence is care, exactness, persistence and consistency, have not a wholly fair chance. One of the principal reasons, therefore, why the sciences do not loom larger in present-day education is the fault of that education and not of the sciences.

\* A third point of importance in the educational status of the sciences is involved in the fact that they have not as yet had time to become organized and standardized for their most effective educational use. The humanities have behind them so many generations of experience that they are now measurably standardized throughout, and offer a continuous and suitably-graded training from kindergarten to college. But the sciences as laboratory-taught subjects are not much more than a single generation old, and many of their problems are still unsettled. In the higher grades our teaching is better than in the lower, while, as everybody knows, we are still far from any consistent and continuous system of instruction in nature knowledge in the lower schools. Just here lies a great weakness of scientific education at the present day, for students too often are sent into high school and college not only without the positive advantage of good early training, but even with a prejudice against a kind of activity of which they have had little, or too often an unfortunate, experience. This condition is inevitable to the youthfulness, educationally, of the sciences, and will be remedied in time.

The last point I would mention in the educational relations of the sciences to the older subjects is this, that the sciences are under some minor disabilities from which the others are free. These center in the laboratory, and are connected in part with the fact that the laboratory type of study, with its mechanical manipulation, its fixed hours and methods of work, and its absolute requirement of independent observation, is distasteful to the great majority of persons, who, whether by natural inclination or acquired habits, prefer to absorb their knowledge in physical ease, by methods which can be lightened by the wits, and from printed books upon which they can lean for authority. Again, laboratories are expensive, much more expensive than the equipment of the other subjects. This acts as a check to the sciences all along the line, while in poorer communities it is often determinative against their introduction at all.

Now it may seem, at this point, that I have needlessly infringed on your patience and my own allotment of time in thus enumerating such obvious matters, but in truth I have had a good object, which is this: I wish to emphasize that all of these disabilities under which science-teaching now labors, these elements of our problem which are not our own fault and for the most part are beyond our control, and the list of which I have made as long as I could,—all of these taken together go only a very small way towards explaining the deficiency of the sciences in education. This deficiency, I believe, is for the most part our own fault and removable, and it all centers in this, that we are not teaching our subjects properly. And now I have reached the real theme of my present address.

Whenever we are faced by any large problem, we tend to seek its solution in some single great factor. Yet, as the phe-

nomena of our own science so often illustrate, the solution is as likely to be found in the cumulative action of several small causes, and such I believe to be true of the problem before us. These causes are some four in number, of which the first appears to be this—*we are not faithful to the genius of our subject.*

The genius of science consists in exact observation of real things, critical comparison of actual results, and logical testing of the derived conclusions. The educational value of science consists in a training in these things, and our teaching should reflect them. Yet in fact in too great part it does not. For one thing we have joined in the rush to render our subjects popular, a spirit which is one of the pernicious by-products of the elective system under which most of us work. Our subjects being elective, students will not take them unless they are made attractive: our success as teachers is largely judged by the number of students we can charm into our courses: our colleagues stand ready to cry "snap" to any course which grows faster than they can see cause for: therefore the logical procedure for the teacher is to draw great numbers but keep them complaining of the work, and he is the greatest teacher under this system who can attract so many students that a new building must be provided immediately, while their lamentations over the difficulty of the course are loud enough to reach the ears of all of his colleagues! Now this condition can be attained with quantity, though not with intensity, for most students will not elect a course involving intensive work which they can not escape, but they are willing to elect one in which the work may be eased by the wits, no matter how copious the irrigation of information may be. Just here indeed is a very fundamental trouble with our education in general. We are teaching our stu-

dents to gobble when they need to be taught to fletcherize.

Another phase of our treason to the genius of science is found in the belief and practise of some teachers that broad generalizations are the true aim of elementary teaching. I know a recent elementary textbook in which the author laments that "some teachers do not yet understand the importance of imparting to beginners a general rather than a special view point." And I could cite many passages to show a belief of this and some other teachers that subject matter, accuracy in details, and other fundamental verities of science, are not important in comparison with viewpoints and outlooks on life and that sort of thing. In my opinion there can be no greater educational error. There is no training which American youth needs more than that in a power to acquire knowledge accurately and to work details well. Disregard for particulars and a tendency to easy generalities are fundamental faults in American character, and need no cultivation, but, instead, a rigorous correction.

Another phase of our disregard of the genius of science is found in the bad character of some of our elementary teaching. Our plant physiology in some cases is so erroneous that it is only the general badness of our teaching which saves us from the humiliation of having our errors pointed out by those we are trying to teach. Our elementary experiments ought to be conducted in the spirit of rigid control, just as carefully as in any investigation. The motto in the experimenting recommended by our text-books seems to be, "the easiest way that will give a result in agreement with the book," and we seem not to care whether that result is logically or only accidentally correct. In this spirit is the use of make-shift and clumsy appliances instead of accurate and convenient ones,

something which is justifiable only when no better can possibly be had. Such slipshod and inaccurate ways are not only wasteful of time and effort, but are actually pernicious because they inculcate a wrong habit and ideal of scientific work. I do not mean at all, here or anywhere, that young pupils should be made to study advanced scientific matters or to use technical methods, but simply that the treatment of their subjects according to their grades should be strictly scientific in spirit as far as it goes. Moreover, any attempt to avoid this spirit is the more unfortunate because needless, for as a matter of fact the great majority of young people respect exactness, and really like to be made to do things well. They do not like the process at first, and will avoid it if they can, but they like the result, and if the process be persisted in they come in time also to like that.

In a word the first great need of our science teaching is to make it scientific.

The second of the four principal causes of our inferior teaching is this, *we take more thought for our subject than we do of our students*. In the graduate teaching of a university this attitude is logical, but in college and school it is wholly wrong. I think we may express the matter thus, that any teacher who is more interested in his subject than in his students is fit only for a university. It is, I am sure, somewhat more characteristic of scientific than of other teachers that they tend to shut themselves up in their subjects, and to withdraw more than they ought from the common interests, duties and even amenities of the communities in which they live. For this, of course, the very attractiveness of science is largely responsible, because to those who have once passed the portals, science offers an interest so vastly and profoundly absorbing that all other matters appear small by comparison; and we are

apt to conclude that the nobility and beneficence of such a mistress are sufficient justification for a complete immersion in her service. We forget that science has no existence apart from humanity, and no meaning unless contributory, however indirectly, to human welfare and happiness. And it should be emphasized to every young teacher that success in science teaching, as in so many other occupations, is well-nigh in direct proportion to one's ability to influence people. Our science teaching would be better if our teachers trusted less to the abounding merits of their subjects, and more to the qualities which personally influence young people—the sympathetic qualities involving interest in their pursuits, the diplomatic qualities involving the utilization for good purposes of the peculiarities of human nature, the perfecting qualities involving the amenities and even the graces of life. There is no inconsistency between these things and the preservation of the scientific quality of the teaching. It is simply a question of the presentation of science in a manner which is humanistic. It is the gloving of the iron hand of the scientific method by the soft velvet of gentle human intercourse. Science is the skeleton of knowledge, but it need lose nothing of its strength and flexibility if clothed by a living mantle of the human graces. It is idealism with realism which is demanded of the science teacher, and if some one would rise to say that this union is logically impossible I would answer, that many a problem of this life unsolvable by the subtleties of logic can be settled by robust common sense.

Of our over-neglect of the personal peculiarities of our students I know several illustrations, but have space only for one. Young people appear to have in them some measure of Nägeli's innate perfecting principle, which leads them upon the

whole to respect and like those things which are good and clean and dignified, a feeling which manifests itself in their strivings after good clothes, good society and things supposedly artistic, not to mention innumerable longings after the lofty unattainable. Now a dirty or carelessly-managed laboratory is a direct shock to this feeling, and most scientific laboratories sin in these features. I believe there is no part of a college or school equipment which ought to be prepared and managed with more care than a scientific laboratory. Efficiency for its purpose is of course the first requisite of any laboratory, but in college or high school that efficiency should be secured with attention to the utmost of pleasing effect, in the direction of a large simplicity, evidence of care for each feature, and an atmosphere of spacious and even artistic deliberation. As an example of what can be done by good taste to give a pleasing setting to the most unpromising objects, I commend the New York Zoological Park, which embodies an idea much needed in most of our botanical institutions. We ought not to permit the accumulation of dusty and disused articles around laboratories any more than around libraries: our teaching museums should contain no crowded accumulations of half-spoiled specimens in leaky green bottles, but only a selection of the most important, and those in the best of receptacles well labeled and tastefully displayed. Our experiments with plants should not exhibit dirty pots on untidy tables, but every plant should present an aspect suggestive of considerate care, while all the surrounding appliances should glitter with cleanliness and stand on a spotless table widely enmargined with space and neatness. One of my friends in a neighboring college has said of the methods of my laboratory that they savor of the old maid. I take pride

in this compliment, for it shows I am advancing. All of these qualities of care, neatness, concentration upon a few large and worthy things, can be made to appeal greatly to youth, as I have learned from experience. Besides, they are scientific, and they are right.

There is yet one other phase of this subject of humanism in science teaching which I wish to emphasize. I think we do not make enough use in our teaching of the heroic and dramatic phases of our science, of the biography of our great men and the striking incidents of our scientific history. I know that their use is attended with dangers, dangers of false sentimentalism, of substitution of weak imagery for strong fact, of complication with religious prejudices; and they should therefore be introduced only as the teacher grows wiser. But when the tactful teacher can employ them to touch the higher emotions of his students, he should do so. The imagination is as necessary a part of the equipment of the man of science as of the man of letters or of art, a matter which has been illuminated with all his usual skill by President Eliot in his great address on the new definition of the cultivated man. When Darwin wrote his famous passage on the loss of his esthetic faculties he was a little unfair to his science and a good deal unfair to himself. For he never mentioned the compensation he had found in the intensity of lofty pleasure derived from his acquisition of new truth. Science hath her exaltations no less than poetry, music, art or religion. Not only is the feeling of elation which comes to the scientific investigator with the dawning of new truth just as keen, just as lofty, just as uplifting as that given by any poetry, any music, any art, any religious fervor, but they are, in my opinion, the same in kind. There is but one music heard by the spirit, and that is

in us, whether it seem to come from the spheres, from the lyres of the muses, or from the voices of angels, and it gives forth when the last supremest chord in the soul of man is touched, it matters not by what hand.

We come now to the third of the causes which make our teaching of science defective, and it is this—we put our trust too much in systems and not enough in persons. And of this there are many evidences. For one thing we rely too much on a supposed virtue in buildings and equipment, though in this we but share the spirit of our machinery-mad day and generation. It is much easier for us Americans to obtain great laboratories and fine equipment than to make good use of them afterwards, and nowhere among us do I see any signs of a Spartan pride in attaining great results with a meager equipment. Moreover, we make a deficiency of equipment an excuse for doing nothing. As one of the most brilliant of American botanists once said, some persons think they can do nothing in the laboratory unless provided with an array of staining fluids which would make the rainbow blush for its poverty. A second evidence of our confidence in systems is found in the easy insouciance with which university professors proceed to write text-books for high schools. The only qualification the most of them have therefor is a knowledge of their subject, and they seem to regard any personal acquaintance with the peculiarities of young people, and with the special conditions of high school work, as comparatively negligible. In consequence these books are necessarily addressed to some kind of idealized student, usually a bright-eyed individual thirsting for knowledge. This kind does exist, but in minority, whereas the real student with which the high school must deal is one of a great

mass willing to learn if it must. Confirmation of the correctness of my view that knowledge of students is as important as knowledge of subject for the writing of a high school book is found in the fact that the author of the botanical text-books most widely used in the high schools of this country has had only a high school experience. Another phase of our belief in the sufficiency of systems is found in the utterly unpractical character of many of the exercises or experiments proposed for the student in some of our books. These recommendations have obviously been worked out in the comfort of the study chair, and have never been actually tested in use by their suggestors; yet they are presented in a way to make the student feel that he is either negligent or stupid if he fails to work them. These theoretically constructed schemes for elementary teaching, and these recommendations of untried and impracticable tasks for students, sometimes run riot in company with sweeping denunciations of our present laboratory courses, and suggestions for their replacement by hypothetical field courses, utterly regardless of the fact that the former, whatever their faults, have been evolved in actual administrative adaptation to the real conditions of elementary work, while the proposed substitutes are wholly untried, and in the light of actual conditions, wholly impracticable.

On the other hand, there is one particular in which we have not system enough, and that is in the standardization of nature study and elementary science courses. I have already mentioned the advantage the humanities have in the approximate standardization of their instruction throughout the educational system, and towards this end for the sciences we ought to bend every effort. For one thing we should give all possible aid and comfort

to our nature-study experts in their efforts to develop a worthy system of nature study in the grades. Again, the peculiar relation of preparatory schools to colleges in this country makes it imperative that we develop standard elementary courses which any school can give with assurance that they will be accepted for entrance to any college. Happily we are here upon firm ground, for we already possess such a standard course, or unit, in that formulated by a committee of botanical teachers, now the committee on education of this society. This course is formulated upon the synthetic principle, that is, it selects the most fundamental and illuminating matters offered by the science without regard to its artificial divisions, and combines these in such manner as to make them throw most light upon one another. Its adaptability to our conditions, and its acceptability to our best educational opinion, is shown by several facts, by its adoption as the unit by the college entrance examination board which has been holding examinations upon it all over the country for six years past, by its use in innumerable high schools, by the agreement between its plan and that of all of the recent and successful text-books, by the final disappearance of all influential opposition to it, and lastly by the substantial concurrence of the unit now in formulation by the teachers of the middle west. With so firm a foundation in a plan we ought to be able to unite on perfecting details. There is no inconsistency between such standardization as this and the greatest freedom in teaching. The optical power of the microscope has not been injured by the standardization of its form and screw-threads.

I come now to the fourth of the reasons why our science teaching is defective, and that is the most vital of all. *Our method*

*of training teachers is wrong.* I believe it is true that in general our educational advances work down from above—from university to college, from college to high school and from high school to the grades; and in a general way each of these institutions is the finishing school for teachers of the grade below. Now the work of our universities is for the most part admirable in every way, but they are not good training schools for college teachers. One of the greatest of our college presidents lately remarked that the principal obstacle in the way of making a college what it ought to be is the difficulty nowadays of securing the right kind of teachers. "We have to take them as the universities supply them," he said, "and then make them into good college teachers afterwards." The defects of the universities in this respect are two-fold. First they are training students only for their own kind of activity, in which everything centers, very properly, in research: and second, they are omitting to teach divers matters very essential for the college teacher to know.

That our universities make research the central feature and great leading method of their training of graduate students is natural, logical and correct, so far as training for their own kind of activity is concerned; but it ignores the fact that only a minority can remain in that work. The justification of the training of all by a method which is correct only for a minority is usually expressed in this form, that he is the best teacher who is an active investigator. Now if this is qualified by the proviso, "other things being equal," it is approximately true; but in fact other things very rarely are equal, and in the matter under discussion they are profoundly unequal. In my opinion the imposition upon all university students of the university research ideal is doing vast

harm to our teaching in college and therefore in high school. For one thing, it sends out ambitious young men imbued with the feeling that they must maintain their research at all costs, or else forfeit the good opinion of their teachers, the possibility of membership in the best scientific societies, and especially any chance for a call to university work, though this latter point should not be given great weight, since to a person with a liking for teaching a good college offers as attractive a career as a university. In consequence there is continual pressure on the teacher to subordinate his teaching to research. Now in college and high school this is wrong, ethically and practically. A college teacher is never engaged for research, but for a very different purpose, and it is his first duty to carry out that purpose to the very best of his ability. If there is any man who can carry on active investigation and at the same time do college or high school work as well as if he were concentrating wholly on that, the man is fortunate, and so is the institution which has him. But in fact this can rarely be true. For one thing, the limitations of time and strength prevent it in most cases; and for another, the qualities and temper required for the two activities are not only different but somewhat antagonistic. Research requires concentration, and much consecutive time fixed by the nature of the work, while the teacher must be ready for constant interruptions, and must regulate his time to fit the schedules of his students. To one immersed in the crucial stage of an investigation the little troubles of students seem absurdly trivial, if not stupid, and under their application for aid he is almost more than human if he can keep a sweet temper and not answer with repellant brusqueness. To the good teacher, the troubles of students are never trivial, but

rather are welcome as means to the advancement of his particular interests. Furthermore, I believe that the research ideal imposed on all men trained in the universities is the cause not only of much injury to teaching, but of much unhappiness to teachers. For if the teacher be conscientious, and gives his first strength to his teaching, he is soon doing his research upon the ragged ends of his nerves. I venture to say that many a teacher today is wishing he could afford to abandon all attempts at abstract research and turn whole-souled to his teaching and matters connected therewith. And when, indeed, he does so, he finds his happiness and his usefulness alike immensely augmented. I know this is true, for I have been through it. It took me many long years to free myself from the feeling that I must continue research or else sacrifice the good opinion of my colleagues. But I am free, and in the two or three years I have been so the added keenness of my pleasure in my teaching, and in various activities related thereto, has been such as to make me feel like a Sinbad who has dropped his old man of the sea. And if there are any among you who believe that I stay in a society given to research only under false pretenses, I ask you to have patience a little, for I purpose to try to convince the society that its rules ought so to be altered as to make teaching, of approved merit and service, a sufficient qualification for membership. Meanwhile I advise all of my colleagues engaged in collegiate work to join in my declaration of independence. Let us show the universities that teaching hath her victories no less than research.

But now I am going to qualify a little. When I say research I mean abstract research, of the university type, the kind which has place on the skirmish line of the forefront of advancing knowledge. In

truth I agree that he is the best teacher who is also an active investigator, but I maintain that in the case of college teachers the investigation ought to have some kind of connection with the teaching. This is entirely possible, for a vast and fruitful field for research lies open in educational organization, in the introduction of more logical, useful and illuminating topics, experiments and methods, in the fitting of science better to the growing mind, in local floras and the natural history of common plants, in ways for better collation and diffusion of knowledge. After all, it is the spirit of investigation that is the matter of value to the teacher, not the results. A contemplation of the status of much of the investigation put forth by busy teachers somehow seems to suggest a saying of one of our senior botanists, who was in his youth somewhat of a botanical explorer, and always a genial wit. Apropos of the making of bread in camp he has been heard to remark that "it may not result in very good bread, but it's great for cleaning the hands." In investigation as elsewhere, results are most surely and economically won by experts, selected, trained and devoted to that work. The college teacher would do better not to waste his strength on a field in which he can be little better than an amateur, especially when there lies open another in which he can himself be an expert, and that is in educational-scientific investigation.

From this which the university ought not to do, I turn now to things which it leaves undone. It is not giving to those who are to be college teachers certain knowledge and training which are indispensable to good teaching. Thus, it does not insist that they shall know the common facts about the familiar plants around them. The old type of botanical course, consisting in the study of the morphology

and identification of the higher plants, is gone forever, not because it was not good, but because the expansion of knowledge has given us something still better. Yet the knowledge involved in the old course is indispensable to every teaching botanist, and I would have a requirement made that no person could be recommended as a competent botanical teacher for a college until he had spent at least two summers of active field work on the critical study of some flora. Again, most of our university-trained teachers know nothing more of the historical or biographical phases of the sciences than they may have picked up incidentally. Yet for purposes of teaching, a knowledge of the history of the science itself, and of its relations to other great matters, is vastly important, in part for the favorable background it offers for the projection of our present-day knowledge, and in part for the purpose of placing the dramatic, heroic and humanistic aspects of the science at the disposal of the teacher. Again, the teacher may go forth from the university without any other than the most fragmentary knowledge of laboratory administration, although there is a rapidly developing technique of efficient and economical management of laboratory construction, furniture, apparatus, supplies, materials, manipulation; and the lack of any training in these is one reason why our science is so often disgraced, and our influence weakened, by slovenly botanical laboratories. Again, the teacher takes up the instruction of young people without any knowledge whatever of the results, very valuable, all imperfect though they still are, which have been won in the scientific study of the psychology of the adolescent mind. And finally he receives no training in the collation and exposition of scientific knowledge, a subject of such importance that I shall speak of it in a moment apart. Training in

investigation he also needs, of course, and that he now gets with ample efficiency. We need a standardization of preparation for college and high-school teaching of the sciences, with appropriate titles or degrees. We are as yet far enough from such a condition, but not wholly without some progress to record. For one university, Chicago, in its school of education, has a department of botany and natural history, administered, by the way, by one of our members and colleagues whose accomplishments in the past give promise of great service to come.

But now once more I wish to qualify a little. While I believe that a training in common knowledge of plants, in the history of our science, in laboratory administration, in the psychology of youth, in the collation and exposition of knowledge, as well as in investigation, is indispensable to the best botanical teaching, and should be included compulsorily in the training of botanical teachers, I do not blame the universities for not providing such instruction, nor am I sure that it is a correct or economical university function. But there is one thing of which I am sure, and it is this, that there is a place in which such training is practicable and wholly appropriate and that place is the graduate department of the college.

Just here I wish to turn aside for a moment to consider a bit more this matter of training in the collation and exposition of knowledge. The expansion of science in our day has been so vast, the literature has become so voluminous, the specialization of method and thought are so extreme, that it is becoming a serious question how the results of new research, when not of a sensational nature, can be quickly, accurately and adequately incorporated into the general mass of our knowledge and made available to the intellectual or economic uses of our

race. Every scientific man has witnessed the ignoring of new truth long after its announcement, and the repetition of old error long after its disproof, not alone in popular information and literature, but even in the best scientific text-books; and this mal-adjustment between scientific research and general knowledge waxes constantly greater. The trouble is plain; we have no recognized collators of knowledge, scholars whose business it is to stand between the investigator and the general user of knowledge and to interpret correctly the results of the one to the other. The need for such service was pointed out long ago by Francis Bacon. In his prophecy of the future development of scientific knowledge, veiled under his story of "The New Atlantis," he describes the division of duty among the scholars of Salomon's House. He says:

Then after divers meetings and consults of our whole number, to consider of the former labours and collections [an obvious prophesy of our scientific meetings], we have three that take care, out of them, to direct new experiments, of a higher light, more penetrating into nature than the former. These we call Lamps. . . . Lastly, we have three that raise the former discoveries by experiments into greater observations, axioms, and aphorisms. These we call Interpreters of Nature.

To-day we have our lamps, and their light shines steadily and benignantly forth. We call them universities. But where are our interpreters of nature? Though we need them, we have them not. They should be our colleges. In all of the great body of intellectual endeavor there is no greater weakness and no greater opportunity for service, than in the interpretation to all men of the results secured by research, not in science alone, but in other departments of knowledge as well. It is the absence of such interpreters which leaves room for the charlatans of knowledge, the mendacious reporter who uses his bit of college information to give a specious semblance of

truth to his inventions or exaggerations, and the nature fakir whose literary skill is his sole qualification. This interpretation of knowledge is no easy matter. Compilation will not do, for the interpreter must repeat observations and experiments far enough to give him a personal and familiar grasp of the materials. Nor even is a first-hand knowledge of the materials enough; he must also be able to set them forth in exposition with a combination of pedagogical clearness and literary force. So little developed is the interpretation of knowledge in comparison with its acquisition that although we have many strong journals devoted to research we have almost none devoted to interpretation and exposition. We have two or three popular journals, carried on by the devotion of loyal individuals, but with all the conditions for success against them. A suitable journal for the collation, interpretation and diffusion of botanical knowledge can only be conducted by an institution whose credit is involved in its permanence and efficiency. It should be marked by dignified form, artistic dress, and literary grace, with departments covering so completely their fields that no person with a serious interest in the science can possibly afford, and much less be willing, to be without it. Such a journal must of course be heavily subsidized, or endowed, especially at first; but there is not at present any place in the educational structure where an endowment would tell so heavily. It would be worth more to education than the endowment of any professorship that I can think of, even a professorship of botanical education in my own college. Such a journal should issue from a college, not a university. I would like to edit it, and I have the plans worked out in complete detail; but I shall not undertake it unless the business foundation can first be made secure.

Not only does the training of interpreters of nature, and of other knowledge as well, whether as teachers, as writers, through the editing of suitable journals, or other activities, seem wholly appropriate to a college, but I think it would offer the colleges themselves a mission which would react grandly on their general efficiency. There is an agreement that the first function of the college is the training of young people in the qualities which go to make more effective members of organized human society. But there is also a general feeling that somehow this is not by itself quite sufficient, for while it offers a worthy and amply difficult educational service, it does not provide a sufficiently-absorbing intellectual interest. Our colleges require, for the maintenance of high intellectual tone, both of students and of teachers, some more vigorous intellectual resistance than undergraduates alone can offer. It is in response to this feeling that some colleges have established graduate work, but in all cases, so far as I know, of the investigation or university type. For such work, however, our students should be sent to a university, which can provide far better than any college the facilities, companionship and atmosphere essential to its successful pursuit. To encourage young people, who are never well informed upon these matters and who do not understand the differences between institutions, to come to a college for work of the university type, is little better than attracting them under false pretenses. It would be much better for our educational system if the colleges would do no graduate work at all, unless they can offer something which they can do better than the university. In the training of their own and high-school teachers, and other interpreters of knowledge, they have, from the very nature of their activities and the presence right at hand of the best of all practise

schools, a work which they can do better than the university. I hope ere long to see, in one of our greater colleges, the establishment of the first graduate school devoted to the training of these interpreters of knowledge.

But now I have reached the bounds which custom and courtesy allow to a speaker for this kind of address, and although I think with regret of the many large matters I fain would include to make my account of this subject complete, I must come to a close. I shall add but one thing, which is this—a summary of the objects for which we should work.

1. A continuous and adequate system of nature study in the schools, so complete and so good as to send every student into the high schools with no prejudice against science, and with a solid foundation of natural fact knowledge.

2. A four-years' course in the high school in the standard sciences, upon exactly the same basis of efficient teaching and educational dignity as any other subjects whatever, being required in so far as they are required, and elective in so far as they are elective.

3. A system of education in the college which will preserve the golden principle of the elective system—viz., the fact that the mind like the body derives greater good from an exercise in which it can take an interest than from one in which it does not—while pruning away the absurdities that have been allowed to graft themselves thereon. The logical system is the group system, in which the student is free to choose his group, but having once chosen it, finds his studies arranged on a plan approved as wise by educational experience. We must not expect a majority ever to choose the science groups, but those who do should receive a training qualitatively equal to that in any subjects whatever, and,

above all, thoroughly but humanistically scientific.

4. A critical review and retesting of our present educational methods and material, with a view to the elimination of the impracticable, the replacement of the mediocre, and the introduction of better, to be sought through critical educational research.

5. A system of training of teachers which shall recognize that college teachers and university investigators are not one and the same, but fellow craftsmen, entitled to equal honor for equal achievement. The training of the university investigator belongs to the university, but of the college teacher to the college, which should establish the suitable instruction in the practical and humanistic phases of the subject. And since the college teacher is from his profession primarily an interpreter of knowledge, he should make that his particular field; and the colleges should cherish and develop, as their particular function, all activities connected therewith.

These things, I believe, will make the sciences free from their present educational disabilities. It is true they will not give us perfection. But what is perfection, and who wants it? Perfection, so I fancy, for I never have seen it, is in this like truth, that there is more pleasure in seeking than in finding it. Besides, man, for whom we are doing it all, is imperfect, though the extent thereof depends upon the point from which we view him. If one were to look down upon him from the place of the angels towards which he likes to believe he is ascending, he must seem a very poor creature, deserving only of pity. But if one looks up after him from the place of the beasts from which we know he has risen, then he looms as a very grand figure, worthy of credit and honor. After all, perfect or imperfect, good, bad or indif-

ferent, he is the very best thing of which we are sure. It behooves us, therefore, to make the most of him.

W. F. GANONG

SMITH COLLEGE

PRESENTATION OF THE LANGLEY MEDAL  
TO THE WRIGHT BROTHERS<sup>1</sup>

*Mr. Chancellor:* The award of the Langley medal to the Brothers Wilbur and Orville Wright emphasizes the fact that we are living in an age of great achievements.

The twentieth century had hardly dawned when the world was startled by the discovery of radium, which has opened up an entirely new field to science, and which has led us to modify profoundly our conceptions regarding the constitution of matter.

Another new field has been revealed to us through the development of wireless telegraphy and telephony; and we now utilize the vibrations of the ethereal medium of space for the transmission of thought.

Then again, we may note the most revolutionary changes going on before our eyes relating to methods of transportation.

The appearance of the hydroplane-boat probably foreshadows a revolution in marine architecture and propulsion. On land we see motor-cycles, automobiles and electric cars displacing the horse. Petroleum and electricity have become powerful rivals of steam; and we seem to be on the eve of a revolution in our methods of railroad transportation, through the application of the gyroscope to a monorail system. And now aerial transport has come, dispensing with rails and roads altogether. The air itself has become a highway; and dirigible balloons and flying machines are now realities.

<sup>1</sup> Historical address by Dr. Alexander Graham Bell at the Smithsonian Institution, February 10, 1910.

How well the predictions of Langley have been fulfilled. We now recognize that he was right, when he said a few years ago (1897) that:

The world, indeed, will be supine if it do not realize that a new possibility has come to it, and that the great universal highway overhead is now soon to be opened.

It has been opened; and who can foretell the consequences to man?

One thing is certain: that the physical obstacles to travel have been overcome; and that there is no place on the surface of the globe that is inaccessible to civilized man, through the air.

Does this not point to the spread of civilization all over the world; and the bringing of light to the dark continents of the earth?

THE PIONEERS OF AERIAL FLIGHT

Who are responsible for the great developments in aerodromics of the last few years? Not simply the men of the present, but also the men of the past.

To one man especially is honor due—our own Dr. S. P. Langley, late secretary of the Smithsonian Institution. When we trace backwards the course of history we come unfailingly to him as *the great pioneer of aerial flight*.

We have honored his name by the establishment of the Langley medal; and it may not be out of place on this, the first occasion for the presentation of the medal, to say a few words concerning Langley's work.

LANGLEY'S WORK

Langley devoted his attention to aerodromics at a time when the idea of a flying machine was a subject for ridicule and scorn. It was as much as a man's reputation was worth to be known to be at work upon the subject. He bravely faced the issue, and gave to the world his celebrated

memoir entitled, "Experiments in Aerodynamics."

In this work he laid the foundations for a science and art of aerodromics; and raised the whole subject of aerial flight to a scientific plane.

The knowledge that this eminent man of science believed in the practicability of human flight gave a great stimulus to the activities of others, and started the modern movement in favor of aviation that is such a marked feature of to-day.

Every one now recognizes the influence exerted by Langley on the development of this art. The Wright Brothers too have laid their tribute at his feet. They say:

The knowledge that the head of the most prominent scientific institution of America believed in the possibility of human flight was one of the influences that led us to undertake the preliminary investigations that preceded our active work. He recommended to us the books which enabled us to form sane ideas at the outset. It was a helping hand at a critical time, and we shall always be grateful.

#### CONTRIBUTIONS TO THE SCIENCE OF AERODROMICS

Langley's experiments in aerodynamics gave to physicists, perhaps for the first time, firm ground on which to stand as to the long-disputed questions of air resistances and reactions. Chanute says:

(a) They established a more reliable coefficient for rectangular pressures than that of Smeaton.

(b) They proved that upon inclined planes the air pressures were really normal to the surface.

(c) They disproved the "Newtonian Law," that the normal pressure varied as the square of the angle of incidence on inclined planes.

(d) They showed that the empirical formula of Duchemin, proposed in 1836 and ignored for fifty years, was approximately correct.

(e) That the position of the center of pressure varied with the angle of inclination, and that on planes its movements approximately followed the law formulated by Joessel.

(f) That oblong planes, presented with their longest dimension to the line of motion, were

more effective for support than when presented with their narrower side.

(g) That planes might be superposed without loss of supporting power if spaced apart certain distances which varied with the speed.

(h) That thin planes consumed less power for support at high speeds than at low speeds.

The paradoxical result obtained by Langley that it takes less power to support a plane at high speed than at low, opens up enormous possibilities for the aerodrome of the future. It results, as Chanute has pointed out, from the fact that the higher the speed, the less need be the angle of inclination to sustain a given weight, and the less therefore the horizontal component of the air pressure.

It is true only, however, of the plane itself; and not of the struts and framework that go to make up the rest of a flying machine. In order therefore to take full advantage of Langley's law, those portions of the machine that offer head resistance alone, without contributing anything to the support of the machine in the air, should be reduced to a minimum.

#### CONTRIBUTIONS TO THE ART OF AERODROMICS

After laying the foundations of a science of aerodromics, Langley proceeded to reduce his theories to practise.

Between 1891 and 1895 he built four aerodrome models; one driven by carbonic acid gas, and three by steam engines.

On May 6, 1896, his "Aerodrome No. 5" was tried upon the Potomac River near Quantico. I was myself a witness of this celebrated experiment; and secured photographs of the machine in the air, which have been widely published.<sup>2</sup>

This aerodrome carried a steam engine, and had a spread of wing of from twelve to fourteen feet. It was shot into the air from the top of a house-boat anchored in a quiet bay near Quantico.

<sup>2</sup> A photograph of this flight was here shown.

It made a beautiful flight of about 3,000 feet, considerably over half a mile. It was indeed a most inspiring spectacle to see a steam engine in the air flying with wings like a bird. The equilibrium seemed to be perfect, although no man was on board to control and guide the machine.

I witnessed two flights of this aerodrome on the same day; and came to the conclusion that the possibility of aerial flight by heavier-than-air machines had been fully demonstrated. The world took the same view; and the progress of practical aerodromics was immensely stimulated by the experiments.

Langley afterwards constructed a number of other aerodrome models which were flown with equal success, and he then felt that he had brought his researches to a conclusion, and desired to leave to others the task of bringing the experiments to the man-carrying stage.

Later, however, encouraged by the appreciation of the War Department, which recognized in the Langley aerodrome a possible new engine of war, and stimulated by an appropriation of \$50,000, he constructed a full-sized aerodrome to carry a man.

Two attempts were made, with Mr. Charles Manley on board as aviator, to shoot the machine into the air from the top of a house-boat; but on each occasion the machine caught on the launching ways, and was precipitated into the water. The public, not knowing the nature of the defect which prevented the aerodrome from taking the air, received the impression that the machine itself was a failure and could not fly.

This conclusion was not warranted by the facts; and to me, and to others who have examined the apparatus, it seems to be a perfectly good flying machine—excellently constructed, and the fruit of years

of labor. It was simply never launched into the air, and so has never had the opportunity of showing what it could do. Who can say what a third trial might have demonstrated. The general ridicule, however, with which the first two failures were received prevented any further appropriation of money to give it another trial.

#### CONCLUSION

Langley never recovered from his disappointment. He was humiliated by the ridicule with which his efforts had been received; and had, shortly afterwards, a stroke of paralysis. Within a few months a second stroke came, and deprived him of life.

He had some consolation, however, at the end. Upon his death-bed he received the resolution of the newly formed "Aero Club of America," conveying the sympathy of the members, and their high appreciation of his work.

Langley's faith never wavered, but he never saw a man-carrying aerodrome in the air.

His greatest achievements in practical aerodromics consisted in the successful construction of power-driven models which actually flew. With their construction he thought that he had finished his work; and, in 1901, in announcing the supposed conclusion of his labors he said:

I have brought to a close the portion of the work which seemed to be specially mine—the demonstration of the practicability of mechanical flight—and for the next stage, which is the commercial and practical development of the idea, it is probable that the world may look to others.

He was right, and the others have appeared. The aerodrome has reached the commercial and practical stage; and chief among those who are developing this field are the brothers Wilbur and Orville Wright. They are eminently deserving of

the highest honor from us for their great achievements.

I wish to express my admiration for their work; and believe that they have justly merited the award of the Langley medal by their magnificent demonstrations of mechanical flight.

*MEMORIAL TO THE LATE MORRIS  
KETCHUM JESUP<sup>1</sup>*

*Members of the American Museum of Natural History:* We commemorate this afternoon the founding of the museum in 1869. For their services to our city and country we pay our tribute to the first presidents, John David Wolfe and Robert L. Stuart, and especially to the third president, Morris Ketchum Jesup, distinguished by his long and eventful administration.

As the oldest institution of the kind in the city of New York we welcome representatives of our twin sister, the Metropolitan Museum of Art, of our younger companions the Public Library, the Brooklyn Museum, the Zoological Park, the Aquarium and the Botanical Garden—all animated by the same purpose, all under a similar government, and together forming a chain of free educational institutions of which the city may well be proud.

We are honored by the presence of delegates from the president of the United States, from the governor of this state, from several of the great American universities and national institutions of scientific research.

The leading officers of the city government and of the board of education are present. His honor, the mayor, the president of the park department and the comptroller are members of our board. It is significant that these heads of the second great municipality of the world are uniting

<sup>1</sup> Address of Henry Fairfield Osborn at the celebration of the forty-first anniversary of the American Museum of Natural History.

with us to play the part of hosts in this celebration, because the city and trustees have enjoyed from the first a free and cordial union. From their entire community of purpose there is no reason why they should ever disagree. Through the original application of the museum for land, this institution is legally under the department of parks, but although the relation is amicable and effective, the museums are less a part of public recreation than of the great civic system of education.

A few words may be said as to the kind of educational spirit which has been developed under past administrations and will be increasingly developed in the coming years in other branches of science. They are words as to our future. We believe that we are only on the threshold of the applications of science, or knowledge of the laws of nature as they bear on human morals, welfare and happiness. If there is one new direction which this museum shall take it is in the applications of science to human life. Here people shall have a vision not only of the beauty, the romance, the wonder of nature, but of man's place in nature, of laws as inexorable as the moral commands of God handed down by great religious teachers. Over the portals of our new hall of public health we may well place the inscription, "Learn the Natural Commandments of God and Obey Them." If nature is stern and holds in one hand the penalty for violation of her laws, she is also gentle and beneficent and holds in the other hand the remedy, which it is the duty of science to discover and make known.

What is the part the museum exhibition halls should play in this teaching? An ideal museum is a mute school, a speechless university, a voiceless pulpit; its sermons are written in stones, its books in the life of the running brooks; every specimen, every exhibition, every well-arranged hall

speaks for itself. In this sense, in its appeal to the eye, in its journeys for those who can not travel, the museum is not the rival, but the helpful ally of all the spoken methods of instruction within its own walls and throughout the great city.

Now a few words as to our past. We owe the rise of public spirit in this city and country to the war for the union; that terrible experience brought men and women of all classes together in a closer sympathy, into a new and great union. Thus Lincoln was our prophet at Gettysburg when he said, "This nation under God shall have a new birth of freedom." As will be fully told by the historian of the day, the inspiration to build a free museum for the people of this city came to us through Albert S. Bickmore. Under his scientific guidance and that of Daniel Giraud Elliot the right direction was taken. Both of these men are happily with us in this hall to-day.

The founders of 1869, whose names have recently been inscribed on yonder wall, voiced the public spirit of their day. New York was a relatively small and relatively poor city. It was before the era of the great captains of industry, of the single-handed patrons of art, science and education; nor were there any models on which to draw the lines or to take the scale, there was no British Museum of Natural History, there was no National Museum of the United States. We marvel the more at the audacity of the trustees who conceived a museum so great and who in 1874 approved a general plan larger than that of any building in the world even to the present day, larger than the Escorial of Spain or the National Capitol of Washington. It crowns this occasion that four of the originators of the museum are with us, two of its scientific advisers, two of its founders.

If I were asked which of the founders

contributed most to administration and development I would say unquestionably Mr. Jesup, Mr. Morgan and Mr. Choate. Of the splendid services of our late president is it not delightful that Mr. Choate himself is here to speak?

Our two founders are here, *mirabile dictu*, as young or younger than they were forty years ago. If youth is measured by energy, by productiveness, by patriotism, these founders are two of the very youngest men in the city of New York, as each day brings forth fresh surprising and ever-welcome proofs. Who among the so-called younger generation can equal Mr. Morgan, who has quietly, and almost unknown to the public, sustained the successive administrations of Wolfe, Stuart and Jesup with his loyalty, his time, his advice, his noble gifts, and who stands behind the present administration with undiminished force and generosity.

Are not our very bones founded in the law? In the early years Mr. Choate rendered incomparable and lasting service not only to the two museums, but to the city, in laying down our charter relative to that union of public and private responsibility and beneficence which has been the model on which all the other institutions of the kind in this city have been founded, which has proved by experience to be a perfect union, for it has given the city of New York something far superior either to the publicly administered institutions of foreign cities or the privately owned and privately administered institutions of other great American cities. The essence of this charter and constitution is that from the beginning the city officials as the elective representatives of the people undertake to give the land, the building, the maintenance; the trustees volunteer to give their best ability and their valuable time to administration, their means and that of others to

filling the building with collections. The agreement has been kept on both sides in the best spirit. To the honor of the city of New York be it said that her rulers have never withheld funds from education, neither have her citizens been lacking in generosity. Owing to this peculiarly American and altogether ideal union of public and private endeavor we discover that at the end of forty-one years the amount which the people of the city of New York have contributed to this museum is balanced by an equal amount given by officers, trustees and other friends.

I have therefore great pleasure in introducing as the orator of the day the Honorable Joseph H. Choate, founder, and author of the laws of our being.

#### THE FOURTH ANNUAL REPORT OF THE CARNEGIE FOUNDATION<sup>1</sup>

THE Fourth Annual Report of the President of the Carnegie Foundation, like the three preceding reports, deals not only with the current business incident to the conduct of the retiring allowance system, but takes up also the discussion of questions dealing with educational history and educational policy. Some of these subjects are of immediate interest, such as politics in state institutions, agricultural education, college advertising, the function of the college trustee, the articulation of high school and college, and the like.

During the year the foundation granted 115 pensions amounting to \$177,000. It is now paying 318 pensions, the cost being \$466,000. The professors receiving these pensions come from 139 colleges, distributed over 43 states of the Union and provinces of Canada. To the accepted list of colleges, that is, to the list whose professors may regularly receive pensions under fixed rules as a right and not as a favor, seven colleges were admitted during the year. These were Coe College in Iowa, Swarthmore College in Pennsylvania, the state universities of Wisconsin, Michigan, Minne-

sota and Missouri and the University of Toronto. The governors and legislatures of these states asked for this privilege for their universities.

The governors and legislatures of 26 other states asked that their universities should also be admitted to the foundation. The fact that only five state institutions, one of these in Canada, have been admitted to the Carnegie Foundation, after a year of administration of the rules under which tax-supported colleges and universities become eligible, testifies to the scrutiny exercised in the admission of institutions. As the president explains in his report, the names of certain well known institutions do not appear. This means that some question has arisen in the examination of these institutions which made the trustees feel that it is necessary to wait—such, for example, as the articulation of the institution with three-year high schools, or its failure to maintain entrance requirements, or the maintenance of a weak school of law or medicine below the standards of law and medical departments of stronger institutions.

The report shows, also, that two institutions retired from the accepted list: Randolph-Macon Woman's College, which withdrew after deciding that the election of trustees must be approved by a Methodist Conference, and the George Washington University whose connection with the foundation was ended by the action of the foundation. The reasons stated are that the university had impaired its endowment and that two professors had been arbitrarily dismissed. There are now 67 institutions on the accepted list.

The second section of the report is devoted to an examination of the working of the rules for retirement as shown in the experience of the past four years. The president gives in this connection a summary of a statement from each teacher now upon the retired list as to the reasons for his retirement. As a result of the experience, two changes were made in the rules by the trustees: one extends the benefits of the retiring allowance system so that service as an instructor shall count toward the earning of a retiring allowance. Heretofore

<sup>1</sup> Statement supplied by the foundation.

only service in the rank of professor was counted toward an allowance. The other change makes retirement after twenty-five years of service possible only in the case of disability unfitting the teacher for active service. Except in the case of such disability, the teacher can, under the rules as now framed, claim a retiring allowance only upon attaining the age of sixty-five. Formerly a professor might retire after twenty-five years of service. This change in the rules, does not, however, deprive the widow of a teacher who has had twenty-five years of service of her pension. The action was taken in view of the fact that many men were willing to retire from the position of teachers and go into business, or because they were tired of teaching, or for other reasons entirely foreign to those for which the rule was intended to provide. Only a small minority of those retiring under 65 years of age did so because of ill health.

The third section of the report is devoted to tax-supported institutions. It states in detail the reasons which have governed the trustees of the foundation in dealing with state institutions. Agricultural education and the agricultural college are also treated at length. The trustees make clear their intention to ask of the institutions of every state whether the university and the college of agriculture are competing or cooperating parts of a state system of education. The low standards and general demoralization resulting from the competition of these two types of tax-supported institutions in the various states are definitely pointed out.

The fourth section of the report is devoted to educational administration, and deals with such subjects as financial reports, college advertising, which has in many institutions developed to formidable proportions, the function of the college trustee and other administrative topics. The problems here taken up are those of immediate practical significance in the operation of colleges and universities. The foundation announces that it will distribute within a short time a bulletin suggesting a simple form of treasurer's report which it hopes may obtain general use. It is note-

worthy that only a small proportion of the colleges and universities calling on the public for support print a straightforward financial statement showing what they do with the money collected from the public. An analysis is here given of the duties of the college trustee and the importance of choosing men who will perform these duties.

The fifth section of the report is occupied with more distinctly educational problems, such as the articulation of high school and college, the weighting of college entrance requirements in favor of the classics, the relative value of educational criticism and educational construction. The whole effort in this part of the report, as in former reports, is to urge upon all the colleges in the country, whether state controlled or privately endowed, the necessity of articulation with the state system of education. In this section, also, the president takes up the statement which has been made in several quarters that the foundation might become an arbitrary force in education, and shows that the real power of the foundation is dependent upon its fair discussion of educational issues. The amount of money in the hands of the foundation is insignificant compared with the college endowments themselves, and the president insists that its most substantial asset comes from a fair, impartial and public handling of educational questions.

Following the report of the president is the report of the treasurer. In this matter the foundation has followed the advice which it gives to other institutions and prints a detailed statement, showing not only the larger items of expense, but even the individual salaries which are paid.

The report may be obtained by writing to The Carnegie Foundation, 576 Fifth Avenue, New York City.

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#### SCIENTIFIC NOTES AND NEWS

DR. J. D. VAN DER WAALS, professor of experimental physics in the University of Amsterdam, has been elected a foreign associate of the Paris Academy of Sciences.

DR. S. WEIR MITCHELL celebrated his eightieth birthday on February 15. On the following day he gave a lecture before the College of Physicians of Philadelphia on "William Harvey, the Discoverer of the Circulation of the Blood."

A TESTIMONIAL banquet will be tendered Dr. William H. Welch, of Johns Hopkins University, on April 2. Gold portrait medallions of Professor Welch will be presented to him, and to the Johns Hopkins University and the Medical and Chirurgical Faculty of Maryland.

THE Italian Royal Geographical Society has conferred a gold medal on Commander Robert E. Peary, a silver medal on Captain Robert A. Bartlett, a gold medal on Lieutenant Ernest H. Shackleton and a silver tablet on the Duke of the Abruzzi for his expedition to the Himalayas. Professor W. M. Davis, of Harvard University, was made a correspondent of the society.

PROFESSOR G. H. F. NUTTALL, F.R.S., Quick professor of biology in the University of Cambridge, has been awarded the Mary Kingsley medal by the Liverpool School of Tropical Medicine.

DR. JOHN M. COULTER, professor of botany in the University of Chicago, has been elected president of the Illinois Academy of Science.

M. GURBAIN, of the University of Paris, has been elected president of the French Society of Physical Chemistry.

MR. JAMES E. HOWARD has been appointed an engineer physicist in the U. S. Bureau of Standards.

THE University of Pennsylvania has conferred its doctorate of science on Mr. Samuel Rea, third vice-president of the Pennsylvania railroad and Mr. George S. Webster, chief of the Bureau of Surveys of the City of Philadelphia.

THE officers of the Washington Academy of Sciences for 1910 are: *President*, C. D. Walcott; *Vice-presidents*—Anthropological Society, Walter Hough; Archeological Society, Mitchell Carroll; Biological Society, T. S. Palmer; Botanical Society, David White;

Chemical Society, H. W. Wiley; Engineers' Society, B. R. Green; Entomological Society, A. D. Hopkins; Foresters' Society, Gifford Pinchot; Geographic Society, Henry Gannett; Geological Society, F. L. Ransome; Historical Society, J. D. Morgan; Medical Society, Louis Mackall; Philosophical Society, R. S. Woodward; *Corresponding Secretary*, Frank Baker; *Recording Secretary*, Bailey Willis; *Treasurer*, Arthur L. Day; *Additional Managers*, L. O. Howard, O. H. Tittmann, B. W. Evermann, L. A. Bauer, C. H. Merriam, C. F. Marvin, Geo. M. Kober, F. V. Coville, E. W. Parker.

A COURSE of three lectures on "Amphioxus" was given at the Imperial College of Science and Technology, Royal College of Science, South Kensington, by Professor E. W. Macbride, D.Sc., LL.D., F.R.S., February 14, 21 and 28.

FOUR lectures on "The Anatomy and Relationships of the Negro and Negroid Races" were delivered at the Royal College of Surgeons by Professor Arthur Keith, conservator of the museum, on February 14, 16, 18 and 21.

THE Julius Thomsen memorial lecture of the Chemical Society, London, was delivered on February 17 by Sir Edward Thorpe.

IN memory of the late Dr. Ludwig Mond's scientific eminence and his generous benefaction of £3,000 towards the building of the Institute of Physiology at University College, London, the college committee has resolved to name the biochemistry research department of the institute "The Ludwig Mond Biochemistry Research Laboratory."

DR. CHARLES R. BARNES, professor of plant physiology at the University of Chicago and eminent for his contributions to this subject, one of the editors of the *Botanical Gazette*, president of the Botanical Society of America in 1903 and vice-president of the American Association for the Advancement of Science in 1899, died on February 24, at the age of fifty-one years.

DR. AMOS EMERSON DOLBEAR, for thirty-two years professor of physics at Tufts College, the author of numerous contributions to phys-

ics and an inventor of distinction, died on February 23, at the age of seventy-three years.

PROFESSOR J. EDMUND WRIGHT, associate professor of mathematics in Bryn Mawr College, died on February 20 of heart disease. He was an Englishman and won distinguished honors at the University of Cambridge, being senior wrangler in 1900, first in the second part of the mathematical tripos in 1901, and Smith's prizeman in 1902, and has been for the past seven years a fellow of Trinity College, Cambridge. He was called to Bryn Mawr College in 1903 to succeed Professor Harkness, now professor of mathematics in McGill University. He was the author of numerous papers dealing with a wide range of subjects in the field of higher mathematics, such as the theory of groups, Abelian theta functions, and differential geometry of space. In 1908 his treatise on "Invariants of Quadratic Differential Forms" was published by the Cambridge University Press.

MR. WILFRED STALKER, member of the British Ornithologists' Union to Dutch New Guinea, has been drowned. Mr. Stalker, who was only thirty-one years of age, had displayed much ability as a collecting naturalist.

THE death is announced of Dr. W. Krause, docent in anatomy at Berlin.

THE French Association for the Advancement of the Sciences will hold its thirty-ninth annual meeting at Toulouse in August under the presidency of M. Gariel, professor of biological physics in the faculty of medicine of the University of Paris.

THE Blue Hill Meteorological Observatory, in Milton, Mass., founded and maintained by Professor A. Lawrence Rotch, has just completed twenty-five years' work. The initial investigations of the upper air, undertaken there in the interest of pure science, are now of practical value to aeronauts and aviators.

THE division of physical sciences of the Royal Academy of Bologna calls attention to an international competition for a biennial prize of three thousand lire established from the income of a donation made by one of its

corresponding members, Professor Elia De Cyon, with the object of promoting researches in the subjects in which he has worked. This award will be conferred on competitors whose works treat: (1) The functions of the heart, and, above all, of the cardiac and vaso-motor nervous systems; (2) the functions of the labyrinth of the ear; (3) the functions of the thyroid glands of the hypophyses and of the pineal gland. The first prize will be awarded on March 1, 1911.

THE first ordinary meeting of the society formed by the amalgamation of the Society of Engineers and the Civil and Mechanical Engineers' Society, was held in London on February 7, when Mr. Diogo A. Symons, the first president of the new society of engineers, delivered an inaugural address.

THE Royal Meteorological Society held a meeting at the physical laboratory, Manchester University, on February 23. This meeting was the first the society has held out of London. Papers were read describing the investigations made at the Howard Estate Observatory, Glossop, into the electrical state of the upper atmosphere, and also on the hourly registering balloon ascents which were made from Manchester on June 2-3, 1909. Mr. Lempfert and Mr. Corless will also contribute a paper on "Line-squalls and Associated Phenomena."

ACCORDING to a communication made on February 14 to the Paris Academy of Sciences by M. Lippmann and reported in the *London Times*, Mme. Pierre Curie, the widow of M. Pierre Curie, the discover of polonium and radium, has at last succeeded in isolating one tenth of a milligram of polonium. In order to obtain this result Mme. Curie, working in cooperation with M. Debierne, has had to treat several tons of pitchblende with hot hydrochloric acid. The radio-active properties of polonium turn out to be far greater than those of radium. It decomposes chemically organic bodies with extraordinary rapidity. When it is placed in a vase made of quartz, which is one of the most refractory of substances, it cracks the vessel in a very short

time. But a no less distinctive quality of polonium is the comparatively rapid rate at which it disappears. Whereas it takes one thousand years for radium to disappear completely a particle of polonium loses 50 per cent. of its weight in 140 days. The products of its disintegration are helium and another body, the nature of which has not yet been ascertained, but Mme. Curie and M. Debierne are inclined to believe it to be lead. Its identity, however, will shortly be established, and at the same time science will have had the experimental proof of the transformation of a body which had been believed to be elementary.

A COURSE of nine illustrated lectures upon science and travel has been arranged by the Field Museum of Natural History at the Art Institute for Saturday afternoons in March and April, at three o'clock, as follows:

March 5—"Snapping Live Game on the Roosevelt Hunting Trail," Mr. A. Radclyffe Dugmore, New York City.

March 12—"The Call of the West," Mr. C. J. Blanchard, Statistician, U. S. Reclamation Service.

March 19—"Mongolia and Siberia," Professor Roland B. Dixon, Harvard University.

March 26—"Our Forests and What They Mean," Dr. Charles F. Millsbaugh, curator, Department of Botany.

April 2—"Cliff Dwellers and Pueblos," Mrs. Gilbert McClurg, regent general, The Colorado Cliff Dwellers Association.

April 9—"Some Alaskan Glaciers," Professor U. S. Grant, Northwestern University.

April 16—"Fossil Hunting," Mr. E. S. Riggs, assistant curator, Division of Paleontology.

April 23—"Human Development and Evolution," Dr. Frank R. Lillie, University of Chicago.

April 30—"The Colorado River," Professor O. C. Farrington, curator, Department of Geology.

WE learn from the *Journal* of the American Medical Association that the first biennial meeting of the Far-Eastern Association of Tropical Medicine is to be held in Manila, March 5-14, 1910. The association was established with the idea of bringing together workers in tropical medicine in that part of the world, and is important in that it brings English-speaking scientific workers together for mutual social and scientific improvement.

The sessions in Manila will be held in the new building of the Philippine Medical School near the Bureau of Science and the new Government Hospital. The sessions in Baguio will be held in one of the government buildings. The government has appropriated a liberal sum for entertainment of guests during the meeting. Visits have been arranged to points of interest in the neighborhood. The museums of the Bureau of Science and of the Philippine Medical School will be thrown open and demonstrations of the specimens will be given. There will be a commercial exhibit of remedial appliances and medical equipment appropriate for use in the tropics.

PRESIDENT DAVID STARR JORDAN, of Stanford University, has addressed to President Charles R. Van Hise, of the University of Wisconsin, the following letter:

Will you permit me a word in regard to reform in football? I believe that no reform worth consideration is possible so long as the game allows the play known as "interference," by the legalization of which the Rugby Game was some twenty years ago perverted into the "American Game." As results of the legalization of "offside play" or "interference," forbidden in Rugby, we have the four most objectionable features of the American Game, (a) mass play and "downs," (b) low tackling in the open field, (c) play directed to break down individuals of the opposite side, (d) the domination of professional coaches, whose interests are wholly at variance with those of the university.

In 1904, at the height of the football obsession in California, the presidents and committees on athletics of the two universities notified the students that no form of football having mass play would be again permitted. The students then adopted the Rugby game. It has been tested for five seasons, and it is wholly satisfactory to all concerned. The game demands a much higher grade of skill and alertness. It is far more interesting to watch. It is interesting to the players. It is a sport and not a battle. As with baseball, so with Rugby, each player must know the game. It is played not in armor, but in cotton knee-breeches, and there have been in five years no injuries of any consequence.

The game is now played in the universities and colleges of California and Nevada. It attracts (perhaps unfortunately) larger numbers of spec-

tators than the old game ever did. It is now played in most of the leading high schools of California. It is firmly and permanently established on the Pacific Coast, unless, as in the East, it is modified to suit the purposes of professional coaches. It seems to me that our experience in California should be worth something to our colleagues in the East.

Very truly yours,  
DAVID STARR JORDAN

#### UNIVERSITY AND EDUCATIONAL NEWS

THE medical school of the University of Pennsylvania has been given \$100,000 by an unnamed alumnus to endow a chair to be known as "the Benjamin Rush professorship of physiological chemistry."

THE valuable library on mathematics and science of the late Oren Root, for many years professor of mathematics at Hamilton College, has been presented to the college by his son, Mr. Elihu Root.

THE dedication of three new engineering buildings at the University of Kansas occurred on February 25. The buildings are those provided for by the legislature of 1907, and are a general engineering building, housing the departments of civil and mechanical engineering and, as a temporary matter, the department of electrical engineering; a mining and geology building, and the mechanical laboratory and power plant. In the afternoon, at 2:30, addresses were given by Dean Frank O. Marvin, Dr. Richard C. Maclaurin, president of the Massachusetts Institute of Technology, and Mr. Ernest R. Buckley, president of the American Mining Congress. Following these were the dedication ceremonies, under the direction of Chancellor Frank Strong. In the evening a banquet was held at Robinson Gymnasium, with after-dinner speeches.

THE Dutch government has appropriated \$100,000 for a laboratory of physical and mineral chemistry at Groningen, where Professor F. M. Jaeger is head of the department.

DR. BERTRAM E. BOLTWOOD has been elected professor of radio-chemistry in the graduate school of Yale University.

PROFESSOR SEITARO GOTO has been called to the chair of zoology at the Tokyo Imperial University to succeed the late Professor Kakichi Mitsukuri. Naohide Yatsu, Ph.D. (Columbia), has been appointed assistant professor. Katashi Takahashi, Ph.D. (Chicago), has been appointed to the professorship of zoology at the First High School to fill the vacancy caused by the resignation of Professor Goto.

#### DISCUSSION AND CORRESPONDENCE

##### A SUBSTITUTE FOR CROSS WIRES IN THE SPECTROSCOPE

TO THE EDITOR OF SCIENCE: Should any of the readers of SCIENCE be in possession of spectrometers which are unprovided with cross wires, it may interest them to learn of a cheap method of supplying a substitute for such desirable articles, which has been found of service in this laboratory, and which, so far as the writer knows, has not hitherto been published.

The method consists in inserting, either in the ocular, or telescope tube, at the proper focal point, a thin glass disc on which is etched a cross with lines about as heavy as the wires in an ordinary cross wire eyepiece. This cross, when in focus, appears as perfectly opaque lines, which fully answer the purpose of cross wires.

These discs have been in use here for some time, and their working has been compared with that of the regular cross wire eyepieces without any difference between the two being noticed. In fact, the cross wires of one of our instruments being somewhat too heavy, we removed them, and substituted a ruled disc with manifest gain in ease of working. The glass disc does not seem to obscure any portion of the spectrum; all portions, both of emission and absorption spectra, having been observed therethrough with instruments of various powers, both prism and grating, without any appreciable loss of either brightness or definition.

For observing a bright line spectrum it is

advantageous to have one of the cross lines made shorter than the width of the spectrum. The disc is then so placed in the instrument that this short line is vertical, and hence parallel with the spectrum lines. Under such circumstances, when this short vertical cross line is placed over a bright spectrum line, the latter is seen extending above and below it, and the small dark *ends* of the cross line being thus brought prominently in view, materially assist in marking the spectrum line upon which they are placed. The horizontal arms of the cross are, in this case, of no particular advantage in marking the spectrum lines, but they facilitate the finding of the optic axis of the telescope, and, where the instrument is provided with an illuminated scale, help to align the same. It is best to so place the scale that one end of the short vertical line reaches about the middle thereof.

Various devices may be employed to fix the disc in the spectroscope. If the instrument is provided with a negative ocular, the disc may be placed against the diaphragm, and held in position by a spring wire. It is well in that case to provide the ocular with a sliding eye lens, which can be cheaply done by any good brass worker. If the instrument has a positive ocular and a diaphragm in it, or in the telescope tube, the disc may, as before, be laid against the diaphragm, and if such is in the telescope tube, focused by sliding the ocular, or if that be fixed, the diaphragm may be moved till the cross lines are in focus. Where there is a positive ocular and no diaphragm, as is the case with some instruments, the disc may be cemented to a brass ring of proper diameter to fit snugly inside the telescope tube, and the proper position having been found, the ring can be so set that the cross lines will be at that point. Each of the above devices has been tried in this laboratory and found satisfactory, and others will probably suggest themselves.

It is true that such devices do not always succeed in making the center of the cross and the axis of the telescope coincide; but this is the case in but few cross wire spectroscopes, and, for that matter, a spectroscope is not a

transit, and does not require such a rigid adjustment of the line of collimation as the latter instrument. If the center of the cross is at the center of the disc, and the disc fits its tube snugly, the cross lines will be sufficiently centered. Were an absolutely accurate adjustment of the line of collimation worth the cost, it could be secured by inserting an adjustable ring at the proper focal point and attaching the disc thereto.

The same method of supplying cross lines answers equally well for microscopical observations, either for goniometric, or for polariscopic work; in fact, it was from noting its utility in such microscopic work, that the idea arose of applying it to the spectroscopic investigations.

Several of the above-described discs have been made for this laboratory by the Bausch & Lomb Optical Co. and they have given perfect satisfaction.

C. M. CLARK

#### NOTE ON SOME PENNSYLVANIA FISHES

DURING the warm weather of 1908 and 1909 Mr. R. W. Wehrle, of Indiana, Indiana County, Pa., made a number of collections of fishes, amphibians and reptiles, from his vicinity. As almost all animal life is either extinct or rapidly becoming so in the main basin of the Conemaugh River, possibly the following list will be of use in partly recording a vanishing fish fauna. I take this opportunity to thank Mr. Wehrle for his care in collecting full series of specimens, besides notes and information relative to the former condition of the fish fauna. *Notropis photogenis* and *Micropterus dolomieu* are from Cherry Run and all the others are from Two Licks Creek, besides such other streams as may be mentioned after each. *Ichthyomyzon concolor*, *Salvelinus fontinalis*, *Camptostoma anomalum*, also from Ramsey's Run; *Pimephales notatus*, Ramsey's Run, Harris's Run, Cherry Run and Marsh Run; *Semotilus atromaculatus*, Ramsey's, Harris's, Cherry and Marsh Runs; *Leuciscus elongatus*, Ramsey's and Harris's Runs; *Notropis cornutus*, Ramsey's and Cherry Runs; *N. atherinoides*, Cherry Run; *Ericymba buccata*, Cherry and Ram-

sey's Runs; *Rhinichthys atronasmus*, Ramsey's and Marsh Runs; *Hybopsis kentuckiensis*, *Catostomus commersonnii*, Ramsey's and Cherry Runs; *C. nigricans*, *Moxostoma aureolum*, Cherry Run; *Ameiurus nebulosus*, *Noturus flavus*, *Ambloplites rupestris*, Ramsey's Run; *Hadropterus macrocephalus*, *Boleosoma nigrum*, Cherry and Marsh Runs; *Etheostoma flabellare*, Marsh Run; *Cottus gracilis*, Ramsey's Run.

On July 23, 1899, I secured an example of *Leuciscus margarita* in a tributary of the Alleghany River near Cole Grove, McKean County, the first I know of from that basin.

On July 1, 1907, Mr. T. D. Keim and myself took two examples of *Notropis boops* Gilbert from the Alleghany just above Foxburg, in Clarion County, also the first from that river.

I may note that *Coccogenia* Cockerell and Callaway, *Proc. Biol. Soc. Wash.*, XXII., 1909, p. 190, is an exact synonym of *Coccotis* Jordan, *Rep. Geol. Surv. Ohio*, IV., 1882, p. 852, type *Hypsilepis coccogenis* Cope, monotypic.

HENRY W. FOWLER

ACADEMY OF NATURAL SCIENCES,  
PHILADELPHIA

#### SCIENTIFIC BOOKS

*Die Geographische Verbreitung der Schmetterlinge.* Dr. ARNOLD PAGENSTECHER. Mit zwei Karten. 8vo, pp. ix + 451. Verlag von Gustav Fischer in Jena. 1909.

Geheimrat Dr. Arnold Pagenstecher has long been favorably known to students of oriental lepidoptera as the author of a number of faunal and monographic papers of the highest merit. His investigations, which have chiefly related to the Malay Archipelago, inevitably led him to the consideration of questions of geographical distribution, and as the result of comprehensive studies we have before us the present volume.

The work divides itself into three sections.

The first section, occupying fifty-nine pages, deals with the underlying causes of the geographical distribution of the lepidoptera. Soil, temperature, humidity, air-currents and vegetation are discussed with relation to the

distribution of the forms of lepidopterous life. The distribution of the lepidoptera at various elevations above sea-level is considered. The migrations of butterflies, the cosmopolitan character of some species, seasonal dimorphism and local variation are touched upon. Several pages are devoted to the consideration of the influence of the glacial epoch and the various mutations which the surface of the earth has undergone in past geological ages. The influence of parasitic life upon the distribution of species concludes this portion of the work.

The second portion of the work, which occupies the body of the book, extending from page 62 to page 401, is devoted to a statement of the results which have thus far been reached by students of the lepidoptera who have written upon the faunæ of the various continents and islands. The various published lists of species are cited and briefly analyzed, and there is thus supplied a very valuable guide to the literature of the whole subject. This portion of the work displays enormous industry on the part of the author and a very thorough familiarity with what has been written. Dr. Pagenstecher recognizes eight faunal regions, and the distribution which he accepts may be given in tabular form as follows:

#### I. NORTH-POLAR REGION.

(The entire circumpolar northern arctic territory.)

#### II. PALEARCTIC (EUROPEO-SIBERIAN) REGION. Subregions.

##### 1. European.

##### 2. Mediterranean.

Including the Azores, Madeira, the Canaries and Cape Verde Islands; northern Africa, Asia Minor and Syria, as well as all parts of Europe bordering on the northern shores of the Mediterranean.

##### 3. Siberian.

##### 4. Manchurian.

Including Japan.

#### III. INDIAN REGION.

##### 1. India to the Himalayan foot-hills.

##### 2. Ceylonese.

Ceylon and the Maldives and Laccadives.

3. *Indo-Chinese.*

Southeastern Asia, including Hainan, Formosa and the Loochoo Islands.

4. *Malayan.*

Including Malacca and the islands north and west of a line drawn between Bali and Lombok, north and east between Borneo and the Philippines on the west and Celebes on the east (Wallace's Line).

## IV. AUSTRALIAN REGION.

*Subregions.*1. *Austromalayan.*

All the islands east and south of Wallace's Line, including New Guinea, except as hereinafter mentioned.

2. *Australian.*

Australia and Tasmania.

3. *Polynesian.*

New Caledonia, the New Hebrides and the various archipelagoes northward and eastward as far as the Sandwich Islands.

4. *New Zealand.*

New Zealand and the Norfolk, Lord Howe, Auckland and Chatham Islands.

## V. THE ETHIOPIAN REGION.

(Africa south of the Mediterranean states, the Sudan, Madagascar and the nearer islands.)

*Subregions.*1. *West African.*

Tropical West Africa, including St. Helena, Ascension and islands nearer the mainland.

2. *South African.*

(Temperate South Africa.)

3. *East African.*

Portuguese, German and British East Africa, the Sudan, Somaliland, Abyssinia, Aden and southern Arabia.

4. *Malagassy.*

Including Madagascar and the surrounding islands.

## VI. NORTH AMERICAN (NEARCTIC) REGION.

Including the entire continent north of Mexico and south of the Arctic or North Circumpolar Region.

## VII. SOUTH AMERICAN (NEOTROPICAL) REGION.

*Subregions.*1. *Chilean.*

Including Tierra del Fuego, Patagonia, Argentina, Chile, the Falkland, Juan Fernandez and Easter Islands.

2. *Brazilian.*

Covering all the continent north and east of the Chilean subregion, and including the Galapagos Islands and Trinidad.

3. *The Central American and Mexican.*4. *West Indian.*

The Greater and Lesser Antilles.

## VIII. ANTARCTIC REGION.

Kerguelen Islands.

A consideration of the foregoing arrangement shows that in a general way it accords with the known facts of distribution, but nevertheless is open to some objection, more particularly as it does not take account of the fact that many of the regions mapped out are invaded at various points by faunæ which persist at great elevations on the mountain-tops, or by faunæ extending through low-lying semi-tropical areas into more temperate regions. It is well known to students of the geographical distribution of the lepidoptera that the Sonoran fauna of the western portions of North America extends far south into the Central American subregion, and that even the Canadian fauna is represented upon the summits of the highest mountains not only of Central America, but of South America. The Chilean subregion is closely related in many respects to the North American fauna, and we have reason to believe that the genera which are found in the Argentine Republic and are also found in North America, owe their distribution throughout the entire length of the Cordilleran ranges and the temperate regions of South America and North America to a common center of original distribution. The southern extremity of Florida contains a lepidopterous fauna which is strictly West Indian. Similar phenomena present themselves to view in other parts of the world. It is no doubt difficult to adopt any general arrangement which will take account of these facts, and it may perhaps be asking too much to insist that in a work,

which like the present is intended to give a general view of the subject, these details should be emphasized. Upon the whole the arrangement of faunal regions accords well with what has been ascertained by the latest investigations.

The third portion of the book gives an account of the geographical distribution of the various families and genera of the lepidoptera in different parts of the world. Forty-six pages are devoted to this section. This part of the work is in the main satisfactory and as complete as could be expected within the limits of space assigned to the subject by the author.

It is of course impossible to expect that in a work of this magnitude errors should not creep in. Some of those which exist are, however, scarcely pardonable. On p. 4 we are informed that "In North America the entire center of the land between the Rocky Mountains and the Allegheny ranges is occupied by a desert extending southward over a large part of New Mexico, Texas, and northern Mexico." It is rather amazing at this late date to find the mythical "Great American Desert," which occupied a space upon the maps published at the beginning of the last century revived, and to have it even extended eastward as far as the Allegheny ranges through a now populous territory filled with large towns and cities, and abounding in agricultural resources. On page 6 the genus *Teracolus* is stated to occur in North America, as well as in the arid coast regions of northwestern and eastern Africa. This is a singular error. The genus is strictly confined to the old world, and not a single species occurs in the western hemisphere. In many places the work gives evidence of careless proof-reading, as on page 67, where "Ireland" is substituted for "Island," thereby confusing the meaning; on page 315, where the word "Totenmeeres" is substituted for "Rotenmeeres," the Dead Sea being substituted for the Red Sea. Generic and specific names in a multitude of cases are misspelled. On page 317, near the foot of the page, where reference is made to a paper by the present reviewer upon the *Hesperidae* of Africa, eight generic names are cited, of which five are mis-

spelled. Minor defects of this sort, while not detracting from the general value of the work, ought in a future edition to be rigidly excluded.

Upon the whole it may be said that this is the most comprehensive and satisfactory work upon the geographical distribution of the lepidoptera of the world which has up to the present time been written. While not free from defects, as has been suggested, it is a work which must prove itself of great value to all students of the lepidoptera, and it reflects great credit upon the learning and industry of its distinguished author.

W. J. HOLLAND

#### QUOTATIONS

##### THE LENGTH OF SERVICE PENSIONS OF THE CARNEGIE FOUNDATION

THE ethical question involved in the change, however, stands on quite a different basis. We do not find that anything in the report breaks the force of the criticisms made in the letters that have appeared in the *Evening Post*, one from Professor Lovejoy, of the University of Missouri, the other from Professor Weeks, of Columbia University. Nothing could be clearer or more unqualified than the statement in the original rule that professors of twenty-five years' service were "entitled" to the pensions. There is no telling in what degree the plans of professors and of colleges, for the past four years, have been based on the well-grounded expectation that this promise would be carried out. It is true that the foundation gave notice that its rules might be modified "in such manner as experience may indicate as desirable"; nobody can charge it with breach of contract. But to abolish completely, at a stroke, without notice, one of the cardinal features of the system is not the sort of thing that anybody had the slightest reason to anticipate.

Dr. Pritchett says that "the expectation that this rule would be taken advantage of almost wholly on the ground of disabilities has proved to be ill-founded"; but if this is meant as a defense against the charge of want of good faith, it betrays a misty notion of the nature of moral obligations. If disability was

meant to be the basis from the beginning, nothing would have been easier than to say so; if it was not, then it was absolutely honorable, right and proper for any man to avail himself of the retiring allowance offered him without reference to any question of disability. If an error was made in the first place, rectify it by all means; but first stand by the consequences of your error, to the extent demanded by the ordinary standards of honorable conduct between man and man. An absolutely essential requirement of a properly constituted university pension system is that it shall not place upon the professor any sense of obligation other than what is inevitable and inherent in such a system; he must feel that he has earned his pension, just as he has earned his salary, by his past services. If to retire under a pension is to mean to retire under a censorship, the Carnegie Foundation may conduce to the material comfort, but will certainly not conduce to the dignity or the self-respect of the profession of university teaching. And, to come back to the main point, the homely obligation of fulfilling in a reasonable measure substantial expectations that have been raised by one's own declared intentions is a duty antecedent even to the high purposes to which the Carnegie Foundation is dedicated.—New York *Evening Post*.

#### SPECIAL ARTICLES

##### DIPYLIDIUM CANINUM IN AN AMERICAN CHILD

In May, 1909, Dr. Luzerne Coville, of Ithaca, submitted for examination egg packets and a segment of a parasitic worm which had been passed by a boy of eleven years. The segment, which had lain in water for some time, I did not recognize, and I am indebted to Dr. C. W. Stiles for the suggestion that the egg packets probably belonged to a tapeworm of the genus *Dipylidium*.

A short time later another segment, reddish-brown from the enclosed mature egg packets, was discharged and egg masses were found on toilet paper, appearing to casual inspection like blood stains. Careful examination proved them to be of the double-pored tapeworm of the dog, *Dipylidium caninum*. The standard

vermifuges were administered and for two days the stools were sieved without result. It is evident that but a single worm was present and that it was discharged before the somewhat delayed treatment was commenced.

*Dipylidium caninum* (more generally known as *Tænia canina* L., *T. cucumerina* Bl. or *T. elliptica* Batsch) is the commonest tapeworm of pet dogs and cats. At Copenhagen, Krabbe found 78 per cent. of the dogs and 60 per cent. of the cats infested. Ward,<sup>1</sup> 1895, states that it has been found in one fifth to four fifths of all the dogs examined by various European investigators and that it is hardly less common at Lincoln, Nebr.; I have found it common at Ithaca, though I have not made enough examinations to justify a statement in percentages.

On the other hand, it is only accidentally a parasite of man, and instances of its occurrence as such have been regarded as rare. First reported in 1751, by Dubois,<sup>2</sup> a student of Linneus, Zschokke,<sup>3</sup> in 1903, was able to bring together reports of thirty-four cases. All these were European, and Ward,<sup>4</sup> 1900, found no references to the occurrence of the parasite in man in this country. However, Stiles,<sup>5</sup> 1903, reports a case of infestation of a child sixteen months old, at Detroit. Blanchard,<sup>6</sup> 1907, in an exhaustive review of the subject, summarizes sixty cases, of which

<sup>1</sup> Ward, H. B., "The Parasitic Worms of Man and the Domestic Animals," Rept. Nebr. State Board Agr. for 1894, pp. 225-348.

<sup>2</sup> Dubois, G., "Tænia." *Linnæi Amœnitates academicæ, Holmiæ*, 1751, II., p. 59. (Cited by Blanchard, *Traité de zool. méd.*, I., p. 481, 1888.)

<sup>3</sup> Zschokke, F., "Ein neuer Fall von *Dipylidium caninum* (L.) beim Menschen," *Centralbl. f. Bakt.*, etc., I. Abt., Originale, XXXIV., pp. 42-43, 1903.

<sup>4</sup> Ward, H. B., article "Cestoda," "Reference Handbook of the Medical Sciences," II., pp. 779-794, 1900.

<sup>5</sup> Stiles, C. W., "A Case of Infection with the Double-pored Dog Tapeworm (*Dipylidium caninum*) in an American Child," *Amer. Medicine*, V., pp. 65-66, 1903.

<sup>6</sup> Blanchard, R., "Parasitisme du *Dipylidium caninum* dans l'espèce humaine, à propos d'un cas nouveau," *Archiv. de Parasit.*, XI., pp. 439-471.

the only American is the case reported by Stiles. Since Blanchard's paper appeared, he has reported one new case at Paris, while one has been reported by Francaviglia for Italy, making a total of sixty-two reported cases. While, therefore, *Dipylidium caninum* can hardly be regarded as a rare parasite of man, Dr. Coville's case is worthy of record as occurring in this country.

From the view-point of the student of the relation of insects to disease, these cases are of interest because the intermediate hosts of this tapeworm are the dog louse, *Trichodectes canis*, and the flea, *Ctenocephalus canis*. Infestation can not take place directly from swallowing the eggs of the parasite, any more than in the case of other typical tapeworms, but only through ingestion of the infested insect. The dog normally becomes infested by biting the flea or louse. Man may accidentally ingest one of the insects and the parasites are able to complete their development in the unusual host.

This accounts for the fact that the great majority of cases reported are of young children, whose association with dogs and cats is more intimate, and who are likely to scrutinize less closely articles of food or drink. From Blanchard's summary, it appears that about 77 per cent. of the reported cases are of children under three years of age. Six are of adults and, counting Dr. Coville's case, three are of children between the ages of nine and twenty years. In the one under consideration, the boy's constant playmate was a bull terrier which was afterwards found to harbor the *Dipylidium*.

WM. A. RILEY

#### ANTHROPOLOGY AT THE BOSTON MEETING, WITH PROCEEDINGS OF SECTION H

As was the case a year ago, the American Anthropological Association and the American Folk-Lore Society met in affiliation with Section H of the American Association for the Advancement of Science. The sessions which began on December 27 and lasted till noon on December 30 were held in the Engineering Building of the Massachusetts Institute of Technology. The attendance was better than a year ago and a number of important papers were presented. Professor William H.

Holmes was present as vice-president of Section H and president of the American Anthropological Association, while Dr. John R. Swanton presided over the single session in charge of the American Folk-Lore Society.

#### SECTION H

Officers for the Boston meeting were nominated as follows: Member of the council, Professor Franz Boas; member of the general committee, Dr. Charles Peabody. Sectional offices were filled by the nomination of Professor Roland B. Dixon, Cambridge, Mass., as vice-president for the ensuing year; and Professor Geo. B. Gordon, member of the sectional committee to serve five years. In accordance with a change in the constitution enlarging the sectional committee, the section recommended to the council that the American Anthropological Association, the American Folk-Lore Society and the American Psychological Association be designated as societies suitable for affiliation with Section H.

#### Addresses and Papers

The address of Professor R. S. Woodworth, retiring vice-president of Section H, entitled "Racial Differences and Mental Traits," was published in SCIENCE on February 4. It was followed by an important discussion on related topics such as: brain weight in relation to race, intelligence and the finer structure of the brain; and the relative influences of heredity and environment, in which Professors H. H. Donaldson, Frederic Adams Woods, E. E. Southard, Franz Boas and J. McK. Cattell took part. The address of Dr. John R. Swanton, president of the American Folk-Lore Society, on "Some Practical Aspects of the Study of Myths," will be published in the *Folk-Lore Journal*.

Most of the papers read at the joint meeting are represented in this report by abstracts. These are:

*Some Fundamental Characteristics of the Ute Language:* Dr. EDWARD SAPIR.

The Ute language, originally spoken in much of Colorado and Utah, forms the easternmost dialect of the Ute-Chemehuevi subgroup, according to Kroeber's classification, of the plateau branch of the Shoshonean linguistic stock. It is itself spoken in at least two slightly different dialects, which may be termed Uintah and Uncompahgre Ute. The phonetics of Ute are only superficially easy, actually they are characterized by many subtleties. The consonantal system in its original form can, by internal evidence, be re-

duced to the "intermediate" stops *p*, *t*, velar *q* and labialized *qʷ*, the sibilant *c* (really a sound intermediate between *s* and *c*), the nasals *m*, *n* and *ɲ* and the voiced spirants *w* and *y*; in Uncompahgre *ɲ* seems normally replaced by nasalization of preceding vowel. These consonants undergo various mechanical changes. Before vowels which, for one reason or another, have become voiceless, the stops become aspirated surds (*pʰ*, *tʰ*, *qʰ* and *qʷʰ*), while the nasals *w* and *y* lose their voice, the voiceless *ɲ* often, at least in Uncompahgre, becoming merely nasalized breath with the vocalic timbre of the reduced vowel. Between vowels the stops become voiced continuants (bilabial *v*, trilled tongue-tip *r*, velar spirant *ɣ* and *ɣʷ*). Lastly, if the stops are preceded by a vowel and followed by a voiceless vowel, they become voiceless continuants (voiceless bilabial *v*, voiceless *r*, *x* and *xʷ*). Thus, an etymologically original intermediate *p* may appear in four phonetically distinct forms: *p*, *pʰ*, *v* and *vʰ*; the voiced stops (*b*, *d*, *g*, *gʷ*) may also, though not normally, be heard as modifications of original intermediate stops, particularly after nasal consonants. To be carefully distinguished from the simple consonants are the long consonants (*pp*, *tt*, *qq*, *qqʷ*, *cc*, *mm* and *nn*) and consonants with immediately following or simultaneous glottal affection (such as *mʰ*, *wʰ*, *ttʰ*). The vowels are perhaps more difficult to classify satisfactorily. As etymologically distinct vowels are probably to be considered *a*, *u*, *i*, weakly rounded *ɔ*, and perhaps *ü* and *ɪ* (Sweet's high-mixed-unrounded?). The influence of preceding and following vowels and consonants, however, gives these vowels various shades, so that actually a rather considerable number of distinct vowels are found (thus *u* may become close or open *o*, *i* before *v* is a very different vowel from *i* before *ɣ*, *a* is often palatalized to open *e*, and so on). The various vowels, in turn, exercise an important influence on neighboring consonants (thus *i* palatalizes preceding *q* to *kʲ*, voiceless *r* has quite different timbres according to the quality of the reduced vowel following it, and so on). As often in English, it is possible to distinguish between slowly pronounced normal forms and allegro forms. Every syllable, in its original form, ends in a vowel or glottal catch; where it seems to end in a consonant, more careful analysis shows that the aspiration following it has a definite vocalic timbre. Words ending in a voiced vowel are invariably followed by a glottal catch or by a marked aspiration.

Nouns are, morphologically speaking, of two

types. The absolute form is either identical with the stem, the final vowel of non-monosyllabic nouns becoming unvoiced (thus *pāʰ*, "water," and *pun qʰa*, "pet horse," from stems *pa* and *puñqu-*), or certain suffixes may be added to the stem to make the absolute form. These suffixes are *-tte* (from *-ttci*) and *-n-te*, which are particularly common with nouns denoting animate beings, though often found also with other nouns, and *-vʰ* and *-m-pʰ*, which are often employed to give body-part nouns a generalized significance. In first members of compound nouns, which may be freely formed, these suffixes are lost, but with possessive pronouns *-ttci* is kept, while *-vi* and *-mpi* are lost. Only animate nouns regularly have plurals. Plurals are chiefly of three types: some nouns, particularly person nouns, have reduplicated plurals; others add *-w* (objective *wa*) to the stem; still others have a suffix *-mʰ*. All nouns with possessive suffixes may form a reduplicated distributive meaning "each one's —." The possessive relation, when predicative, is generally expressed by the genitive-objective form of the independent person pronoun preceding the noun (thus *nʰ nai mʰiʰeʰ*, "it is my hand," absolute *mʰ ɔ vʰ*), when attributive, by suffixed pronominal elements (thus *mʰ ɔ-nʰ*, "my hand"). Eight pronominal suffixes are found: first singular, second singular, third singular animate, third singular or plural inanimate, first dual inclusive, first plural inclusive, first dual or plural exclusive and third plural animate. The genitive-objective or non-subjective form of the noun is made by suffixing *-a*, less commonly *-i*, to the stem, the possessive pronoun suffixes always following the objective element; as the objective *-a* often appears as a voiceless vowel, or, owing to sentence phonetics, may be elided altogether, the deceptive appearance is often brought about that the objective differs from the subjective merely in having the unreduced form of the stem (subj. *puñqʰa* from *puñqu*, obj. *puñqʰaʰ* or *puñqʰu* from *puñqʰa*). A well-developed set of simple and compound postpositions or local suffixes define position and direction with considerable nicety.

Verb stems differ for singular and plural subjects, often also for singular and plural objects, the dual always following the singular stem. In some cases the singular and plural stems are unrelated, in others they are related, but differ in some more or less irregular respects, in still others the plural has a reduplicated form of the stem, and in many cases the plural is differentiated from the singular by the use of a suffix

-qqa (or -kk' a). Reduplication is used to express not only plurality of subject or object, but also repeated activity; some verb stems always appear in reduplicated form. The pronominal elements are the same as in the case of the possessive suffixes; they may either be appended to, not thoroughly incorporated with, the verb as suffixes, the objective elements always standing nearer the stem, or they may be appended as enclitics to a noun or adverb preceding the verb. When pronominal subject and object are both expressed as enclitics they may either appear together in either of the ways just described, or the subject may be attached to a word preceding the verb, while the object is suffixed to the verb; it seems that only third person pronominal enclitic objects can be combined with following enclitic subjects. Ute has both prefixes and suffixes in its verbs, the former being less transparently affixed elements. The most interesting of the prefixes are a set of elements defining body-part instrumentality; some of the ideas expressed by the suffixes are aoristic activity, futurity, intention, momentaneous action, completion and others. An important feature of Ute is the presence of numerous compound verbs, the second stem generally being a verb of going, standing, sitting or lying. Sometimes these second elements of compounds have quasiformal significance (thus "to be engaged in eating" is expressed by "to eat-sit").

*On a Remarkable Birch-bark Fragment found in Iowa:* Mr. WARREN K. MOOREHEAD.

Some thirteen years ago there were found near Fairfield, Iowa, two pieces of oak wood fitted together and covered with gum or wax. The oak had been cut with stone axes, and apparently the wax was of aboriginal origin. There was a slight hollow or cavity in the center of each piece of wood. When the wood was fitted together this cavity would be four inches square and an inch thick. Within this had been folded and placed a strip of birch bark of unknown length. The workmen in digging out this piece of wood struck it with a pick and broke it open. There was a strong wind blowing at the time, and half of the birch bark was blown away and lost. The other fragment was preserved and given to a school teacher. She sent the specimen to Mr. R. S. Peabody, founder of the museum at Andover. The author is convinced of the genuineness of this find. The specimens were submitted for examination and comment, the latter being favorable in respect to their authenticity.

*The Condition of the Ojibway of Northern Minnesota:* Mr. WARREN K. MOOREHEAD.

This paper, while not strictly ethnological in character, is based upon over four months' residence this summer with these Indians at White Earth, Minn., for the Indian Office, Washington. The Indians have abandoned their old-time customs and taken on many of the vices of the whites. The Mid-di-wi-win, or grand medicine society, was not as of old. Day Dodge, a man of eighty-two, is the sole survivor of the Mid-di-wi-win members of the old school, and to his keeping is entrusted the birch-bark records. He has agreed to translate these and present them to the museum at Andover.

These Indians have been cheated out of fully 90 per cent. of the 11,000 allotments of pine timber and farm lands issued to them by the government at Washington. They now live in unsanitary cabins, are crowded together and have lost much of their tribal life.

*The Chronic Ill Health of Darwin:* Dr. ROBERT HESSLER.

A study of the chronic ill health of Darwin after the manner of the paleontologist, the data in the "Life and Letters" and "More Letters" being studied in the light of the ill health of a number of individuals who seem to have similar ill health. It is largely a study of environmental influences and of interpreting symptoms, not of disease, but of ill health, and showing on what the ill health depended. The paper was illustrated by charts.

*Anthropology in the Peale Museum:* Mr. GEO. H. PEPPER.

The Peale Museum of Philadelphia was an institution of note in the days when scientific collecting was in its infancy. For many years it has been known that it contained a fair-sized collection of anthropological material, but none could say how much or what the character of the specimens.

Charles Willson Peale was the founder of this interesting institution which began its active career in 1794. The general history and a monograph on the ornithological specimens have been written, but no record of the anthropological material is known to exist. In the archives of the Pennsylvania Historical Society an accession book was found. It gives the accessions from 1805 to 1842 and it is from these entries that the major part of the information presented in this paper was obtained. The most interesting of

these were selected, and among them were the records of specimens obtained by Merriweather Lewis and William Clark, "In their voyage and journey of discovery up the Missouri to its source and to the Pacific Ocean." The rather long list of specimens noted are from the various tribes visited by these early explorers. Among other entries of note were specimens collected by Colonel Pike and other noted travelers.

A general history of the museum with its various homes and the final sale of the material brings the paper to the final disposition and fate of many of the specimens. All that are known to be in existence are now in the Peabody Museum of Harvard University at Cambridge, Mass.

*Calf Mountain Mound in Manitoba:* Professor HENRY MONTGOMERY.

In September last (1909) Professor Montgomery excavated an ancient artificial mound, which for many years has been known to the residents of southern Manitoba as "Calf Mountain." It is situated on a natural ridge in Manitou County. This mound is about eighty feet in diameter and ten feet in height. Openings had been made in it by other persons some twenty years ago. During the investigation of it about thirty days' work in digging has been expended upon this mound. The excavations brought to light nine burial places within a circular area of thirty-five feet in diameter, and under conditions which point to the mound's having been built in portions at different times. The objects in the burial places are in different conditions as to their preservation, and in addition to this the calcareous layers which covered the burials were found to overlap in such a manner that the more recent layers extended above and over the older ones without a break or interruption.

The objects found consisted of bone armlets with carving upon them, shell ornaments, copper beads, a piece of tanned hide, birch bark baskets, human skeletons and skulls of buffaloes.

*Huron Moose Hair Embroidery:* Dr. F. G. SPECK.

This paper deals objectively with the moose hair appliqué embroidery of the Huron Indians now living at Lorette, P. Q., Canada. The present known distribution of this type of decoration was given, followed by remarks on its antiquity and history. Details of the technique, of which there are six varieties, were treated and illustrated from specimens collected by the author and from those preserved in the collections of various museums. A list of nineteen decorative figures

shows the prominence of flower designs in this art, since all but two of the figures represent either partial or complete flowers or trees. The author described and interpreted the figures found on various embroidered specimens. The paper concluded with a discussion of both the technique and the symbolism of Huron art, and, so far as was possible, a comparison of the designs with those of adjacent tribes. This paper, the material for which was obtained during several visits to Canada in 1908-9, is intended to appear, illustrated with figures and plates, in a new volume of the Anthropological Publications of the University of Pennsylvania Museum.

*Assiniboine Folk-lore:* Dr. ROBERT H. LOWIE.

The Assiniboine, as a Dakota tribe living for a long time in close contact with the Cree, might naturally be expected to exhibit in their mythology traces of both Siouan and Algonkian influence. As a matter of fact, the trickster-hero cycle presents relatively few homologies with Siouan mythology, but bears the impress of western Algonkian influence. On the other hand, the miscellaneous folk-lore tales, while to a considerable extent shared by the same tribes, do not show the predominance of their influence, because an approximately equal number has also been recorded among the Omaha. From a psychological point of view, it is interesting to note that Inktonmi, who appears in the mythology of the Dakota proper as a pure trickster type, assumes among the Assiniboine some characteristics of the culture-hero. The secondary association of elsewhere distinct motives is also abundantly exemplified.

*What is Totemism?* Mr. A. A. GOLDENWEISER.

An analysis of the various definitions of totemism discloses a set of phenomena generally covered by that term. In examining the two typical totemic regions—Australia and northern British Columbia—we find them differing in all essential points. If we then follow up the various social and religious phenomena comprised in totemism, in a number of cultural areas we find that each one of these phenomena may and does occur independently, often stands for different psychological facts, and has an independent origin.

In totemism then we must see an association of these several factors. From this point of view totemism becomes the product of a process of convergent evolution, and we are confronted with a number of historical and psychological problems to be investigated.

*The Myth of Seven Heads:* Professor ALEXANDER F. CHAMBERLAIN.

Among the "miscellaneous tales" recorded by Dr. Clark Wissler and Mr. D. C. Duvall, in their recent monograph on the "Mythology of the Blackfoot Indians" is "a myth of a seven-headed person who made a business of devouring young women." He is killed by a man who receives "power" from some animals for whom he settles a quarrel. The conclusion of the tale is as follows: "After this he married a princess. Then the thunder stole her, but he secured her by killing a lion, then an eagle, which flew out of the lion, then a rabbit, which came out of the eagle, then a dove, which came out of the rabbit, etc."

The authors cited comment upon this tale: "This story is believed by the Indians to have been brought in by the French." The conclusion certainly suggests such an origin, with its mention of a "princess," and the succession of animals killed.

But a "tale of Seven-heads" is known from the Kutenai,<sup>2</sup> the Arapaho and Sarcee—and probably also the Gros Ventre. So far as the present writer is aware, the only native text of the "tale of Seven-heads" hitherto obtained is the unpublished Kutenai version recorded in 1891 by him from the dictation of a Lower Kutenai Indian. In the Kutenai version Wistatlatlam (Seven-heads), is defeated and killed by a youth named Sanuktlaent (Bad Shirt), after he has been given "medicine," to make him strong, by a young woman, his wife. Here the tale is thoroughly Indian in aspect; the "princess" is absent; and the story ends by the hero cutting out or pulling out the tongue of his defeated adversary, and carrying it home as evidence of his triumph.

The Kutenai version seems to prove that we have here an original Indian legend, which in the case of the Blackfoot version noted above has been contaminated from European sources, the Kutenai retaining the simpler aboriginal form.

Professor W. H. Holmes, president of the joint meeting of Section H and the American Anthropological Association, read an important paper on "Some Problems of the American Race," which was illustrated by original and instructive diagrams. The paper, being still unfinished, will not

<sup>1</sup> *Anthrop. Pap. Amer. Mus. Nat. Hist.*, 1908, II., 163.

<sup>2</sup> Chamberlain, *Rep. Brit. Assoc.*, 1892; Kroeber, *Anthrop. Pap. Amer. Mus. Nat. Hist.*, 1907, I., 57.

be published at present. Dr. S. A. Barrett's two communications on "The Characteristics and Material Culture of the Cayapa-Indians" and "The Cayapa Spirit World" are extracts from a larger work which will appear shortly as part of a series printed privately and entitled, "Contributions to South American Archeology." The paper by Dr. George Grant MacCurdy, on "The Alligator Motive and Figures with Mixed Attributes in the Ancient Art of Chiriqui," is to appear as a monograph in the Anthropological Publications of the University of Pennsylvania.

Two other papers were read, of which the secretary has no abstracts: "Native American Ballads," by Mr. Phillips Barry; and "A Possible Explanation of Conventionalized Art," by Dr. H. J. Spinden.

The following papers were read by title:

(a) *Rock Inscriptions*; (b) *Stages of Progress in Parallels of Latitude*: Dr. STEPHEN D. PEET.

(a) *The Incensario*; (b) *The Distribution of Gray Pottery in the Pueblo Region*: Dr. WALTER HOUGH.

*Symbolism in a Japanese Marriage*: Mrs. SARAH S. JAMES.

*Distribution of South American Linguistic Stocks* (map): Professor A. F. CHAMBERLAIN.

*An Introductory Paper on the Tewa Language* (printed in this journal): Mr. JOHN P. HARRINGTON.

*Literary Form in Oral Tradition*: Professor FRANZ BOAS.

*Folk Songs and Music of Cataluna*: Mr. A. T. SINCLAIR.

*A Grammatical Sketch of the Coos Language of Northwestern Oregon*: Mr. LEO J. FRACHTENBERG.

One of the particularly attractive features of the week was "Cambridge Day," all members of the joint meeting being guests of the Division of Anthropology of Harvard University. The morning was spent at Peabody Museum, after which luncheon was served at the Colonial Club. Special cars were provided both to and from Cambridge. Many members also took advantage of the special facilities offered by their respective officers to visit the museums of anthropology at Salem and Andover. The social functions included a number of special luncheons and dinners given by local anthropologists and their friends.

GEORGE GRANT MACCURDY

YALE UNIVERSITY,  
NEW HAVEN, CONN.

## SOCIETIES AND ACADEMIES

## THE INDIANA ACADEMY OF SCIENCE

At the annual meeting of the Indiana Academy of Science, held at Indianapolis, Ind., on November 25-27, the twenty-fifth anniversary of the founding of the academy was celebrated. A special program was arranged under the direction of Honorable Amos W. Butler, one of the charter members of the academy and the acknowledged father of it. His plan was to bring together not only the present membership, but all the living ex-presidents and charter members as well as representatives of the educational and scientific societies of this and adjoining states. Among those who responded to this invitation were President Jordan, of Leland Stanford University; J. M. Coulter, of Chicago University; H. W. Wiley, chief of the Bureau of Chemistry, and B. W. Evermann, of the Bureau of Fisheries, Washington, D. C.; W. A. Noyes, of the University of Illinois; C. A. Waldo, of Washington University, St. Louis; Dr. A. Springer, of Cincinnati, and George T. Moore, of the St. Louis Botanical Gardens. In addition delegates were present representing the Indiana Teachers' Association, the Indiana Medical Society, the Indiana Section of the American Chemical Society, the Indiana Audubon Society, the Indiana Engineers' Society, the Indiana Historical Society, the Indiana Physics Teachers' Society, the Association of Science and Mathematics Teachers.

At the general sessions on Friday about three hundred were present to listen to the addresses of A. L. Foley, president of the academy, President Jordan and Professor J. M. Coulter. The same evening a banquet was held in the Claypool Hotel at which covers were laid for more than one hundred. Professor D. W. Dennis, of Earlham College, acted as toastmaster and responses were made by President Jordan, Dr. A. Springer, Hon. B. W. Everman, Professors J. M. Coulter, Glenn Culbertson, Geo. T. Moore and M. H. Stuart. The membership committee reported fifty-six names for membership. The following were elected officers for the coming year:

*President*—P. N. Evans, Purdue University.

*Vice-president*—C. R. Dryer, State Normal School.

*Secretary*—G. W. Benton, Shortridge High School, Indianapolis.

*Assistant Secretary*—A. J. Bigney, Moore's Hill College.

*Treasurer*—W. J. Moenkhaus, State University.

*Editor*—H. L. Bruner, Butler College.

The papers and addresses will appear in the *Proceedings*, which is published annually from an appropriation made by the state. The following is the program of the meeting:

*Thursday, November 25*

Meeting of the executive committee.

Informal dinner.

Address—"By Packtrain to the Tiptop of the United States in Quest of the Golden Trout," B. W. Evermann, U. S. Bureau of Fisheries, Washington, D. C.

*Friday, November 26*

President's Address—"Recent Progress in Physics," Dr. A. L. Foley, Bloomington.

Address—"Recent Progress in Chemistry," Dr. H. W. Wiley, chief of the Bureau of Chemistry, U. S. Department of Agriculture, Washington, D. C.

Address—"Recent Progress in Botany," Dr. John M. Coulter, department of botany, Chicago University.

Greetings from other societies.

Informal luncheon.

Address—"Darwin Fifty Years after," Dr. David Starr Jordan, president Leland Stanford University, president of the American Association for the Advancement of Science.

The academy met in sections. A few papers, mostly those of historical character, were read.

Banquet—D. W. Dennis, toastmaster.

*Saturday, November 27*

Address—"Methods and Materials used in Soil Testing," H. A. Huston, Chicago.

Address—"Federal Control of International and Interstate Waters," B. W. Evermann, U. S. Bureau of Fisheries.

Address—"The Speed of Migration of Salmon in the Columbia River," Charles W. Greene, University of Missouri.

Address—"Some Hoosier and Academy Experiences," C. A. Waldo, Washington University, St. Louis, Mo.

Suggestions. Plans for the Academy—John S. Wright, Stanley Coulter, H. E. Barnard, W. E. Stone, C. Leo Mees, W. A. Cogshall.

The following is a complete list of papers presented:

*General*

"Thought Stimulation, under what Conditions does it Occur?" Robert Hessler.

"Does Blood Tell?" William B. Streeter, Greensboro, N. C.

"Hygiene of Indoor Swimming Pools, with Sug-

gestions for Practical Disinfection," Severance Burrage.

"Indiana Problems in Sewage Disposal," R. L. Sackett.

"Defective Elementary Science," William N. Heiney.

"Some Hoosier and Academy Experiences," C. A. Waldo, Washington University.

"Darwin Fifty Years After," David Starr Jordan, president Leland Stanford Jr. University.

"Streamers that Show Reversal of Curvature in the Corona of 1893," John A. Miller.

"That Erroneous Hiawatha," Albert B. Reagan.

#### Chemistry

"Methods and Materials used in Soil Testing," H. A. Huston, Chicago, Ill.

"The Discovery of the Composition of Water" (illustrated), W. A. Noyes, University of Illinois.

"Molecular Rearrangements of Derivatives of Camphor," W. A. Noyes.

"Use of Refractometer in Dry Substance Estimation," A. Hugh Bryan, U. S. Bureau of Chemistry.

"Conductivity and Ionization of Solutions of Certain Salts in Ethyl Amine," E. G. Mahin.

"Recent Progress in Chemistry," H. W. Wiley, chief of the Bureau of Chemistry, U. S. Department of Agriculture.

"Electric Osmose," Harry N. Holmes.

"On a New Complex Copper Cyanogen Compound," A. R. Middleton.

"Determination of Endothermic Gases by Combustion," A. R. Middleton.

#### Mathematics

"A Method of Instruction in Solid Analytical Geometry," Arthur S. Hathaway.

"The Relative and Reduced Equations of Motion of  $n$  Bodies in Space of  $n$  Dimensions or Less," Arthur S. Hathaway.

"Discussion of the Regular Inscribed Pentagon," John C. Gregg.

"If the Bisectors of Two Angles of a Triangle are Equal, those Angles are Equal," John C. Gregg.

#### Physics

"Direct Reading Accelerometers," C. R. Moore.

"Recent Work in Wood Physics," W. K. Hatt.

"Expansion of Paving Blocks," W. K. Hatt.

"Strength of Building Block," H. H. Schofield.

"Slip of Riveted Joints," Albert Smith.

"Polarization of a Cadmium Cell," Rolla R. Ramsey.

"Investigation of the Point Discharge in a Magnetic Field," Oscar W. Silvey.

"The Tenacity of Gelatine," Arthur L. Foley.

"Objections to LaPlace's Theory of Capillarity," Arthur L. Foley.

"Cohesion of Water as Modified by Certain Dissolved Salts," Edwin Morrison.

#### Geology and Geography

"Some Features of Delta Formation," Charles R. Dryer.

"A Physiographic Survey of an Area near Terre Haute, Ind.," Charles R. Dryer, Melvin K. Davis.

"The Collecting Area of the Waters of the Hot Springs of Hot Springs, Ark.," A. H. Purdue, University of Arkansas.

"The Geographical and Geological Distribution of Some Pleistocene Mammals," O. P. Hay, U. S. National Museum.

"On the Restoration of Skeletons of Fossil Vertebrates," O. P. Hay.

"Paleontology and the Recapitulation Theory," E. R. Cummings.

"The Tippecanoe, an Infantile Drainage System," W. A. McBeth.

"Observations on Cyclones and Anti-cyclones of North Temperate Latitudes," W. A. McBeth.

#### Zoology

"A Paired Entoplastron in Trionyx and its Significance," Henry H. Lane, Oklahoma State University.

"Physiological Explanation of the Psycho-physical Law of Weber," Guido Bell.

"On the Nature and Source of Thrombin," L. J. Rettger.

"Federal Control of International and Interstate Waters," B. W. Evermann, U. S. Bureau of Fisheries.

"By Packtrain to the Tiptop of the United States in Quest of the Golden Trout" (illustrated), B. W. Evermann.

"The History of Zoology in Indiana," C. H. Eigenmann.

"An Analytic Study of the Faunal Changes in Indiana," Walter L. Hahn, South Dakota State Normal School.

"Some Notes on Parasites found in Frogs in the Vicinity of St. Paul in June," H. L. Osborn, Hamline University.

"The Mocking Bird in Indiana," A. J. Bigney.

"Cross-fertilization among Fishes," W. J. Moenkhaus.

"Observations on Woodpeckers," John T. Campbell.

"The Development of the Reproductive Organs of *Chara fragilis*," George N. Hoffer.

"Paroxysmal Hemoglobinuria," Oliver P. Terry.

"The Evolution of Insect Galls as Illustrated by the Genus *Amphibolips*," Mel T. Cook, Delaware College.

"The Speed of Migration of Salmon in the Columbia River," Charles W. Greene, University of Missouri.

"Observations on Cerebral Localization," J. Rollin Slonaker, Leland Stanford Jr. University.

"A Study of the Composition of Butter Fat," O. F. Hunziker, G. W. Spitzer.

"The Nasal Muscles of Vertebrates," H. L. Bruner.

#### Botany

"Physiological Apparatus," Frank M. Andrews.

"Some Monstrosities in Plants," Frank M. Andrews.

"A List of Algæ," Frank M. Andrews.

"Revegetation of the Salton Basin" (illustrated), D. T. MacDougal, director Desert Laboratory, Tucson, Ariz.

"Forest Conditions in Indiana," Stanley Coulter.

"Some Additions to Indiana Flora, Number 4," Charles C. Deam.

"The Medicinal Value of *Eupatorium perfoliatum*," A. J. Bigney.

"Right and Wrong Conceptions of Plant Rusts," J. C. Arthur.

"The Effect of Preservatives on the Development of *Penicillium*," Katherine Golden Bitting.

"Recent Progress in Botany," John M. Coulter, Chicago University.

J. H. RANSOM,  
Secretary

#### THE KANSAS ACADEMY OF SCIENCE

THE academy held its forty-second annual meeting at Ottawa, Kans., on December 28, 29 and 30.

After the usual business meeting on the evening of December 28, Professor Frank E. Jones, of the University of Kansas, lectured on "A Tour of the Philippines." The lecture was very interesting and illustrated by projections of many photographs, obtained by the author during several years' residence in the islands.

On Wednesday the reading and discussion of papers were taken up from the following program:

"A Suggested Revision of the Terminology of Agriculture," by L. C. Wooster.

"An Esker near Mason, Mich.," by L. C. Wooster.

"A Rare Mexican Cycad," by W. B. Wilson.

"Recent Methods in Organic Analysis," by E. R. Groner.

"Successful Termination of the Loco Weed Investigation," by L. E. Sayre.

"Analysis of Food Accessories under the Food and Drugs Law," by L. E. Sayre.

"Physical Culture in Schools," by J. H. Klopfer.

"The Dance and Shamanic Performances of the Quileute Indians," by A. B. Reagan.

"Sketches of Indian Life and Character," by A. B. Reagan.

"Maxwell's Method of Comparing Electrostatic Capacity with Self-inductance," by J. A. G. Shirk.

"A New Geometrical Figure and its Possible Application," by E. C. Warfel.

"Preliminary Note on Measuring the Speed of Photographic Shutters," by H. I. Woods.

"Pollution of Domestic Ground Water Supply," by S. J. Crumbine.

"Tools and Toys," by B. B. Smyth.

"Milk-sickness in Kansas," by L. C. R. Smith.

"The Flora of Minima Hill," by L. C. R. Smyth.

"An Embryonic Plesiosaur Propodial," by R. L. Moodie.

"Provisional List of the Flora of Kansas," by B. B. Smyth, John H. Schaffner and L. C. R. Smyth.

"Is the Dakota Formation Upper or Lower Cretaceous?" by J. E. Todd.

"Further Notes on Pleistocene Drainage," by J. E. Todd.

"An Aberrant Walnut?" by I. D. Cardiff.

"Fifty Years of Evolution," by A. H. Thompson.

"Additions to the List of Kansas Coleoptera for 1909," by W. Knaus.

"Note on the Food of *Bothrotes Knausii* Caley," by W. Knaus.

"Notes on Kansas Coleoptera," by W. Knaus.

"Kansas Coleoptera—the Families Throscidæ, Lampyridæ, Malachidæ, Clevidæ, Cupescidæ, Cio- idæ, Melandoyidæ, Oedemeridæ, Anthicidæ, Pyro- chroidæ and Rhipiphoridæ," by W. Knaus.

"Changes in the Cottonwood Limestone South of Cottonwood Falls," by J. A. Yates.

"On the Coloring Matter in Fruits," by E. H. S. Bailey and E. L. Tague.

"On the Occurrence of Manganese in Waters," by C. C. Young.

"A Comparison of Some Methods of Making Thymine," by D. F. McFarland.

"On Food Adulterations," by H. L. Jackson.

"The Prairie Dog Situation in Kansas," by T. H. Scheffer.

"Investigating the Mole," by T. H. Scheffer.

"Catalytic Tests and Treatment of Systematic Phthisis," by W. P. McCartney.

"Midcontinent Petroleum," by F. W. Bushong.

"Some Difficulties in Arsenic Tests," by F. B. Dains.

"In the Laramie and Niobrara Cretaceous," by C. H. Sternberg.

"Observations on Cytology of *Equisetum*," by I. D. Cardiff.

The time was closely occupied in this order till 6 P.M., when the academy repaired to Charlton Cottage to partake of an elegant banquet tendered by the local members.

Following the banquet the retiring president, Dr. F. B. Dains, gave an address on "The Lives of Silliman, Hare and Cook, and their Influence on American Science." Dr. J. T. Lovewell gave some personal reminiscences of the elder Silliman and of the methods of teaching chemistry fifty years ago.

On Thursday the reading and discussion of papers were resumed, and in the free and instructive comments and questions, much interest was manifested and advantages gained.

The academy is growing in numbers and influence, having now about two hundred members, and is enlarging its library and museum. In the near future it will have rooms in the Memorial Building, now being erected in Topeka, the state capital, and have a permanence of quarters it has hitherto lacked. The annual volumes of *Transactions*, now published by the academy, are growing in size and value and are welcomed as exchanges by most scientific societies. The present officers were reelected for the ensuing year:

*President*—F. B. Dains, Topeka.

*Vice-presidents*—J. M. McWharf, Ottawa, and A. J. Smith, Emporia.

*Treasurer*—F. W. Bushong, Lawrence.

*Secretary*—J. T. Lovewell, Topeka.

Topeka will be the place of next meeting and the time will probably be during the Christmas holidays.

J. T. LOVEWELL

#### THE CHICAGO ACADEMY OF SCIENCES

At the annual meeting of the Chicago Academy of Sciences, held January 11, the following officers were elected:

*President*—Dr. T. C. Chamberlin.

*First Vice-president*—Mr. A. L. Stevenson.

*Second Vice-president*—Mr. C. H. Blatchford.

*Secretary*—Dr. Wallace W. Atwood.

*Head Curator*—Mr. Frank C. Baker.

The honorary curators were elected as follows: Dr. Thomas C. Chamberlin, general geology; Dr. Stuart Weller, paleontology; Dr. Oliver C. Farrington, mineralogy; Professor E. J. Hill, botany.

Annual reports were received from the trustees, the secretary, the treasurer and the curator. During the past year the emphasis in the museum work has been placed upon ecological exhibits and on the preparation of loan collections suitable for use in the public and private schools of the city. The demand for such material has greatly exceeded the supply and the work will be conducted on a larger scale during the coming year. The academy has undertaken during the past year to enter more intimately and actively into cooperation with the educational institutions of the city to improve and extend the teaching of nature study to the children and the science courses in high schools. To this end a course of instruction was offered to the teachers by Dr. Henry C. Cowles, of the University of Chicago, on "Plants and their Field Relations." For the children, a series of Saturday afternoon lessons was arranged. These were given by Dr. Herman S. Pepoon. The children were admitted as delegates from the seventh and eighth grades in the public schools, each delegate representing his, or her, class. Over one hundred applicants applied for this course and the reports from the teachers and the principals indicate that each delegate returned to the class with an enthusiastic report of the work which had been offered at the academy. These new lines of work were supplemented by lectures given at the schools by members of the staff and by evening lectures at the academy building which were open to the public and to which school delegates were also admitted. The cooperation on the part of the teachers and the principals has been most gratifying and the trustees of the academy have appropriated funds for the continuation and development of the educational and museum extension work during the coming year.

During the past year the academy published a bulletin, on the "Higher Fungi of the Chicago Region," by Dr. Will S. Moffatt. This bulletin is illustrated with twenty-three full-page half-tone plates.

Mr. Frank C. Baker has completed for publication a monograph on the "Lymnaeidae of Middle and North America." This work is the result of ten years of study involving the examination of all the large collections of mollusks in the United States.

Other research work is in progress and additional publications will probably appear during the coming year.

The relationship of the academy to the public during the past year may be tabulated as follows:

Annual attendance to museum .....	300,000
Annual attendance to public lectures ....	4,000
Attendance at the 12 lessons in the first teachers' course (28 teachers $\times$ 12 lessons) .....	336
Attendance at the 6 lessons in the young people's course (6 lessons $\times$ 122 pupils) .....	732
School children addressed by delegates to young people's course .....	50,000
Children addressed at schools by Mr. F. C. Baker, of museum staff .....	11,303
Loan collections from museum (129 school rooms averaging 50 pupils) .....	6,450
Total .....	372,821

WALLACE W. ATWOOD,  
Secretary

#### THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 365th meeting of the society was held January 22, in the main hall of George Washington University, with President T. S. Palmer in the chair and about a hundred persons present.

The following communication was presented:

#### *Fluctuation of Animal Population in the Northwest:* ERNEST THOMPSON SETON.

The speaker described conditions as to animal life observed during his long residence in Manitoba, instancing the marked changes in numbers of indigenous mammals to be seen from year to year. Shrews, muskrats, rabbits, lynxes, wolves and other animals were subject to great fluctuation in numbers. In some cases the causes of change were partially known, but in others they could not be explained. Mr. Seton exhibited charts showing diagrammatically the yearly collections of skins of fur-bearing animals by the Hudson's Bay Company. These showed in a clear way the enormous fluctuations in the fur returns during the years from 1751 to 1891.

An interesting discussion followed. D. E. Lantz called attention to the fact that the prevailing fashions in fur garments often have much to do with the numbers of skins collected. Dr. Palmer showed how the prevailing fashion influences the sale of bird skins and feathers, and how it has often disastrously affected the bird population of certain districts and nearly exterminated a species.

Vernon Bailey told of the occasional vast increases in numbers of small mammals, referring especially to the field mice (*Microtus montana*), which in 1907 and 1908 did enormous injury to crops in the Carson and other valleys of the west. In this instance predatory mammals and birds assisted by unfavorable weather conditions were recognized factors in removing the plague of mice.

Dr. A. D. Hopkins told of the enormous fluctuations in numbers of certain insects, well-known illustrations being afforded by plagues of locusts and crickets and the periodical appearance of cicadas. He gave as a particular illustration the northward migration of the southern pine bark beetle (*Dendroctonus frontalis*), which in 1891 and 1892 culminated in the destruction of a large part of the pine and spruce timber on about 75,000 square miles of the forests of Pennsylvania, Maryland, Virginia and West Virginia. Being a southern species, it could not withstand the extreme cold of the winter of 1892-3, and the species perished throughout the region named, while native insects were not killed. In this case, the sudden change in numbers was well understood.

Dr. Barton W. Evermann called attention to the fact that there is a well-marked periodicity in the run of certain species of fishes. This is notably the case with the humpback salmon in the rivers of the Puget Sound region and the sockeye salmon in the Fraser River. A large run of humpbacks takes place in the odd years (as in 1905, 1907, etc.) and a much smaller run in the even years. A big run of sockeyes occurs every fourth year, the run in each of the three other years of the cycle being smaller. The reasons for this periodicity are not fully understood. These species of salmon, like all salmon on our west coast, spawn only once, then die, even before the eggs hatch; so that no Pacific salmon ever saw any of its children or either of its parents. The life of the sockeye salmon is probably four years. The eggs laid in the Fraser River produce fish which come back four years later to spawn. If the spawning conditions in some year of the remote past were exceptionally favorable and an unusual number of young fish hatched, every fourth year thereafter ought to be a big year for that species. It is believed that an explanation like this is the correct one.

The discussion was closed by Dr. Palmer and Mr. Seton, and the society then adjourned.

D. E. LANTZ,  
Recording Secretary

## THE BOTANICAL SOCIETY OF WASHINGTON

THE fifty-ninth regular meeting of the society was held at the Ebbitt House, January 29, 1910, at eight o'clock, P.M.; President Wm. A. Taylor presided. The following papers were read:

*Legal Regulation of Plant Diseases:* Dr. HAVEN METCALF, U. S. Bureau of Plant Industry.

*Further Botanical Evidence regarding Coastal Subsidence:* H. H. BARTLETT, U. S. Bureau of Plant Industry.

The full paper will appear in a forthcoming number of *Rhodora*.

*The Use of the Immersion Refractometer in the Study of Plant Extracts:* H. C. GORE, U. S. Bureau of Chemistry.

The Zeiss immersion refractometer, an instrument which measures index of refraction of liquids in terms of an arbitrary scale, was shown and its probable usefulness in vegetable physiological studies was illustrated by readings on cane sugar and on cider. The arbitrary scale is so constructed that in many cases the readings, less the amounts due to the presence of water, are almost exactly proportional to the amounts of dissolved substance. This is particularly true for dilute solutions, *e. g.*, dilute solutions of sugars. Tables can therefore easily be constructed for any substances or groups of substances for which tables are now lacking. Solutions can be examined rapidly. Small amounts are required, 1 c.c. being sufficient, though more is desirable, and the solution need not be clear. Further, a definite physical constant, the index of refraction, is determined.

The instrument is brought to the attention of botanists because it is well adapted to field work, and has been found to be very useful in detecting slight differences in sugar content, therefore it may be used in making selections among sugar-containing plants and fruits, and in detecting differences in soluble carbohydrates due to slight changes in environment. The refractometer has been found very useful in the study of the rate of fermentation of apple cider in cold storage. It is also widely used in technical work and in food analysis.

A preliminary study of the ratio of the scale readings, less 15, the reading due to pure water at 17.5° C., to the per cent. of cane sugar in solution, shows that the ratio varies from 3.75 to 4.09 for amounts of sugar from 2.5 to 16 per cent., the figures being as follows:

Per Cent. of Cane Sugar	Ratio of Scale Readings less 15, to Per Cent. of Sugar.
2.5	3.75
5.0	3.81
9.0	3.91
13.0	4.01
17.0	4.09

A study of the ratio of the scale readings less 15, to the total solids, of 13 samples of freshly pressed cider showed the ratio to be 3.91, with a maximum of 4.09 and a minimum of 3.79. It is practicable, therefore, to work out for a plant juice a factor which will relate the scale readings to the content of total solids. By making a proper allowance, to be determined experimentally, for the readings due to the non-sugar solids, the sugars can probably be estimated with a fair degree of accuracy.

W. W. STOCKBERGER,  
*Corresponding Secretary*

## THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

AT the 441st regular meeting, held February 1, 1910, Dr. D. S. Lamb read a paper entitled, "Like Father Like Son: A Study in Heredity."

After a general introduction the speaker gave especial consideration to variations and illustrated with many cases taken from Darwin, Reid, Thomson, Woods, Fay and others. As to reversions, he was inclined to think that many so-called reversions are simply arrests of development. He thought that the attitude of writers on heredity now in regard to the inheritance of acquired characters is that of a negative. As to the inheritance of disease, there was no doubt that a tendency to disease was frequently inherited. The probabilities are that the sperm or ovum is affected by the disease of the parent. He disbelieved in telegency and maternal impressions. A brief statement was made of the more important theories of heredity; he inclined to the Mendelian principle as set forth by Bateson.

In the discussion Mrs. G. R. Stetson and Dr. G. M. Kober pointed out the importance of the problem of heredity in its relation to practical life, especially to education, marriage, public health, and the treatment of criminals and defectives.

Dr. J. Walter Fewkes exhibited and commented on some drawings of divinities, altars and other paraphernalia of worship made by Hopi Indians under his supervision.

I. M. CASANOWICZ,  
*Secretary*